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Urban Transportation Plan

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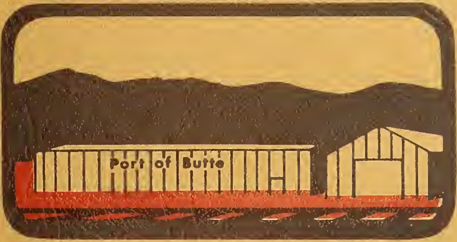

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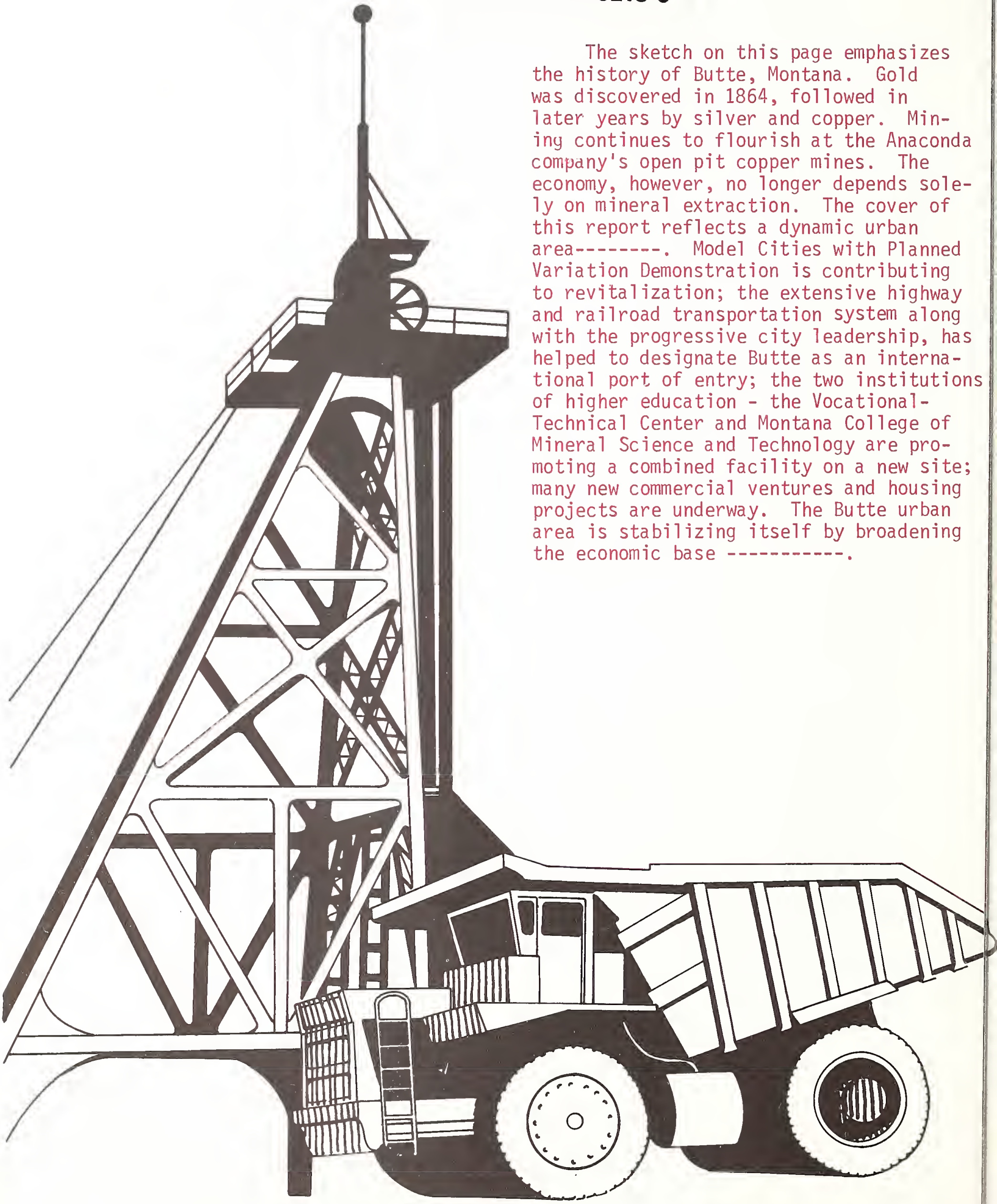
The sketch on this page emphasizes the history of Butte, Montana. Gold was discovered in 1864, followed in later years by silver and copper. Mining continues to flourish at the Anaconda company's open pit copper mines. The economy, however, no longer depends solely on mineral extraction. The cover of this report reflects a dynamic urban area--------. Model Cities with Planned Variation Demonstration is contributing to revitalization; the extensive highway and railroad transportation system along with the progressive city leadership, has helped to designate Butte as an international port of entry; the two institutions of higher education - the Vocational-Technical Center and Montana College of Mineral Science and Technology are promoting a combined facility on a new site; many new commercial ventures and housing projects are underway. The Butte urban area is stabilizing itself by broadening the economic base -----------.



BUTTE
URBAN TRANSPORTATION STUDY
TRANSPORTATION PLAN

Prepared by

CLETE DAILY AND ASSOCIATES

for

MONTANA DEPARTMENT OF HIGHWAYS

PLANNING RESEARCH BUREAU

and

BUTTE - SILVER BOW CITY - COUNTY PLANNING BOARD

in cooperation with

U. S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

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The opinions, findings and conclusions expressed
in this publication are those of the authors
and not necessarily those of the
Federal Highway Administration.

CLETE DAILY AND ASSOCIATES

TRAFFIC ★ TRANSPORTATION ★ PARKING
CITY AND REGIONAL PLANNING

Transportation Technical Advisory
Committee and Policy Committee
Butte Urban Transportation Study
Butte, Montana

Gentlemen:

We are pleased to submit the Urban Transportation Plan for the Butte planning area. Recommendations are set forth which will provide the Butte area with sufficient mobility for residents as well as for persons and goods passing through the urban area.

It is important that this Plan be adopted by the Butte - Silver Bow City - County Planning Board, the Butte City Council, the silver Bow County Commissioners, and the citizens of the urban area. Successful implementation of impending transportation improvements will be dependent upon sources of funding. Approval of future matching funds from the Federal Highway Administration will require that the proposed improvements be part of an adopted Transportation Plan. This Plan, however, is not "final". The Butte Urban Transportation Study should now enter the continuing phase and periodically monitor land use development patterns, travel characteristics, and improvement priorities. As these and other factors change, this Plan should be revised and updated to meet future needs.

This long range Transportation Plan consists of recommended highway improvements, a Central Business District Parking Plan, and recommendations designed to upgrade and assure continued operation of mass transit service.

Our appreciation is extended to citizens, city officials, members of the Transportation Technical Advisory Committee and the Transportation Policy Committee for their valuable assistance and guidance in the preparation of this Plan.

Respectively submitted,

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TABLE OF CONTENTS

PAGE

LIST OF FIGURES v

LIST OF TABLES viii

FOREWORD F-1

CHAPTER I: INTRODUCTION I-1

CHAPTER II: CURRENT TRANSPORTATION FACILITIES II-1

Highways II-3

Mileage II-3
Functional Classification II-5
1973 Traffic Volumes II-6
Traffic Signals II-9
Traffic Accidents II-11
Service Volumes II-14
Federal Aid System II-15
Travel Time II-15

Railroads II-17

Buses II-19

Air Service II-19

CHAPTER III: TRAVEL SURVEYS III-1

Home Interview Survey III-1

Truck Survey III-2

Taxi Survey III-3

External Survey III-3

Screenline and Cordon Line Comparisons III-4

1970 Trip Characteristics III-6

CHAPTER IV: EXISTING AND FORECAST SOCIO-ECONOMIC CONDITIONS IV-1

1970 Socio-Economic Conditions IV-1

Population IV-2
Number of Persons Age Five and Over IV-4
Employment IV-5

TABLE OF CONTENTS

(continued)

PAGE

(CHAPTER IV:)

Households IV-7
Vehicles IV-7
Floor Space IV-8
Existing Land Use Patterns IV-9

1990 Forecasts IV-9

Population, Employment, Households IV-9
Vehicles IV-15
Floor Space IV-15

1990 Land Use Distributions IV-17

CHAPTER V: ANALYSES OF ALTERNATE 1990 HIGHWAY SYSTEMS V-1

1990 Traffic Assignment to Existing Plus Committed System V-1

Deficiencies V-1
Conclusions V-5

Alternate System One (1) V-7

Choosing the System V-7
Coding the System V-9
Results V-12

Alternate System Two (2) V-12

Choosing the System V-12
Coding the System V-13
Results V-13

Alternate System Three (3) V-15
Network Revisions and Traffic Assignment Results V-16

The 1990 Recommended System V-18

Columbia Garden Interchange and Connector V-19
Extension of Wharton Street to Connect Harrison Avenue with Continental Drive V-21

CHAPTER VI: RECOMMENDED HIGHWAY IMPROVEMENTS VI-1

General VI-1

Summary of Recommended Highway Improvements VI-4

TABLE OF CONTENTS

(continued)

PAGE

(CHAPTER VI:)

Project Costs VI-10

Priorities VI-11

Committed Projects VI-13

- Grand Avenue: Harrison Avenue to Continental Drive VI-13
- Harrison Avenue: Olympia Street to George Street VI-13
- Harrison Avenue: IR15-90 to Basin Creek Road VI-18
- Park Street: Excelsior Avenue to Montana Street VI-19

Reconstruction VI-20

- Intersection of Montana Street and Granite Street VI-20
- Intersection of Granite Street and Wyoming Street VI-22
- Intersection of Arizona Avenue and Park Street VI-23
- Intersection of Arizona Avenue and Mercury Street VI-25
- Intersection of Main Street and Mercury Street VI-29
- Intersection of Main Street and Platinum Street VI-31
- Main Street: Second Street to Front Street VI-34
- Harrison Avenue: Front Street to Olympia Street VI-36
- Intersection of Harrison Avenue and Cobban Street and Cobban Street from Harrison Avenue to Florence Avenue VI-40
- Harrison Avenue: Yale Avenue to Cornell Avenue VI-44
- Intersection of Harrison Avenue and Dewey Boulevard VI-48
- Intersection of Continental Drive and Texas Avenue VI-51
- Civic Center Collector Route: Harrison Avenue to Texas Avenue VI-53
- Lowell Avenue: Montana Department of Highways to Proposed Western Beltway VI-53
- Four Mile Road: Safeway Warehouse to Proposed Western Beltway VI-54

TABLE OF CONTENTS

(continued)

PAGE

(CHAPTER VI:)

Montana Street: Rowe Road to Hanson Road VI-55

New Construction VI-55

Urban Beltway VI-56
Collector Route Between Harrison Avenue and Kaw Avenue VI-56
Interstate 15 from Junction of IR15 and IR90 to Northeast Study Area Boundary VI-57

Miscellaneous Improvements VI-59

CHAPTER VII: PARKING VII-1

General VII-1

Assumptions VII-3

Analyses of Existing Conditions VII-4

1990 Central Business District Parking Requirements VII-9

Recommendations VII-15

CHAPTER VIII: MASS TRANSIT VIII-1

History VIII-1

Existing Bus Service VIII-3

Franchises VIII-3
Inventory VIII-3
Personnel VIII-5
Routes and Schedules VIII-5
Charter Operations VIII-6
School Bus Operations VIII-9
Ridership VIII-10
Income and Expenditures VIII-11

Analyses of City Transit Operations VIII-14
Future Operation VIII-17
Recommendations VIII-17

CHAPTER IX: PLAN IMPLEMENTATION IX-1
Funding Sources IX-1

Continuing Study IX-4

APPENDIX

LIST OF FIGURES

Figure Number	Title	Page
I-1	Flow Chart of Urban Transportation Planning Process	I-1
II-1	Montana's Primary Transportation System	II-2
II-2	Relationship of Functionally Classified Systems in Serving Traffic Mobility and Land Access	II-5
II-3	1973 Functional Highway Classification	II-7
II-4	1973 Traffic Volumes	II-8
II-5	Existing Traffic Signals	II-10
II-6	Federal Aid Systems	II-16
II-7	1970 Automobile 24 Hour Average Travel Times	II-18
II-8	Bert Mooney Airport and Adjacent Transportation System	II-21
III-1	Auto-Taxi Screenline Accuracy Check	III-8
III-2	Truck Screenline Accuracy Check	III-8
III-3	Total Vehicle Screenline Accuracy Check	III-8
III-4	Cordon Line Accuracy Check	III-8
IV-1	Existing Land Use	IV-10
IV-2	Forecasts of Population, Employment, and Dwelling Units	IV-13
IV-3	1990 Land Use Plan	IV-16
IV-4	Study Area Sectors	IV-18
V-1	Traffic Assignment to the Existing Plus Committed System Comparison of 1972 Average Daily Traffic with 1990 Average Daily Traffic.	V-2
V-2	Critical Locations	V-4

LIST OF FIGURES

(continued)

Figure Number	Title	Page
V-3	1990 Traffic Assignment - Comparison of Trips Loaded to the Existing Plus Committed System and Test System Number 1	V-11
V-4	1990 Traffic Assignment - Comparison of Trips Loaded to the Existing Plus Committed System and Test System Number 2	V-14
V-5	1990 Traffic Assignment - Comparison of Trips Loaded to the Existing Plus Committed System and Test System Number 3	V-17
VI-1	1990 Traffic Volumes - Recommended Transportation Plan	VI-2
VI-2	Comparison of Vehicle Trip Desire Lines: 1970-1990	VI-3
VI-3	Recommended Highway Improvements	VI-5
VI-4	Harrison Avenue: Grand Avenue to George Street	VI-16- VI-17
VI-5	Intersection of Montana Street and Granite Street	VI-21
VI-6	Intersection of Wyoming Street and Granite Street	VI-24
VI-7	Intersection of Park Street and Arizona Avenue	VI-26
VI-8	Intersection of Mercury Street and Arizona Avenue	VI-28
VI-9	Intersection of Mercury Street and Main Street	VI-30
VI-10	Intersection of Platinum Street and Main Street	VI-33
VI-11	Main Street: Second Street to Front Street	VI-35
VI-12	Harrison Avenue: Front Street to Olympia Street	VI-39
VI-13	Intersections of Cobban Street at Harrison Avenue and Florence Avenue	VI-43
VI-14	Harrison Avenue: Yale Avenue to Cornell Avenue	VI-46- VI-47

LIST OF FIGURES

(continued)

Figure Number	Title	Page
VI-15	Intersection of Harrison Avenue and Dewey Boulevard	VI-50
VI-16	Texas Avenue at Continental Drive and Civic Center Service Road	VI-52
VII-1	Central Business District Parking Inventory	VII-5
VII-2	1964 and 1973 Net Parking Deficiencies	VII-7
VII-3	Comparisons of 1970 and 1990 Trip Destinations Per Zone	VII-13
VII-4	1990 Net Parking Deficiencies	VII-14
VII-5	Suggested Off-Street Parking for Existing and Future Deficiencies	VII-16
VIII-1	Transit Coverage	VIII-7
VIII-2	Butte Bus Lines - Income and Expences	VIII-15
A-1	Zone Map	
A-2	Zone Map - Central Business District	
A-3	Flow Map for Alternate System Testing	
A-4	Alterante System 1 Node Map	
A-5	Alternate System 2 Node Map	
A-6	Alternate System 3 Node Map	

LIST OF TABLES

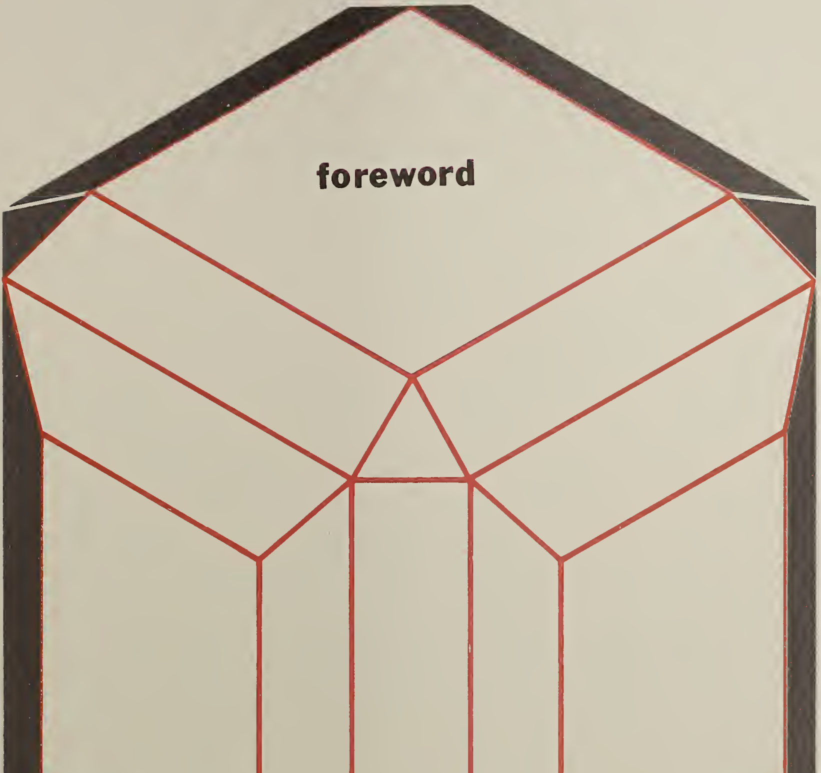
Table Number	Title	PAGE
II-1	Comparison of Population and Road Mileage Per State	II-3
II-2	Comparison of Population and Road Mileage Per County	II-4
II-3	Signalized Intersections with One Signal Face Per Approach	II-11
II-4	1969-1971 Intersection Accident Summary	II-12-II-13
II-5	Federal Aid System Mileage	II-15
III-1	1970 Origin-Destination Travel Survey Trips	III-6
III-2	Summary of Trip Generation Characteristics	III-7
IV-1	1970 Socio-Economic Factors	IV-1
IV-2	Silver Bow County Age Group Trends, 1950-1970	IV-3
IV-3	Potential Dependent Population	IV-4
IV-4	1970 Employment by Land Use Type	IV-6
IV-5	1970 Vehicles Per Household	IV-8
IV-6	Forecasted Increase in Socio-Economic Characteristics 1970-1990	IV-12
IV-7	Employment Forecast By Major Industry	IV-14
IV-8	Sector Comparison of 1970 and 1990 Population, Households, Employment	IV-17
V-1	Existing Plus Committed System, Critical Locations, 1990 Travel	V-5
VI-1A	Recommended Highway Improvements - Cost Summary By Federal Aid System	VI-4
VI-1B	Recommended Highway Improvements	VI-6-VI-7-VI-8-VI-9

LIST OF TABLES

(continued)

Table Number	Title	PAGE
VI-2	Unit Construction Costs	VI-10
VI-3	Number of Projects by Priority Time Period	VI-11
VI-4	Harrison Avenue Physical Characteristics - Olympia Street to George Street	VI-14
VI-5	Harrison Avenue Traffic Flow, Front Street to Olympia Street	VI-37
VII-1	Comparison of 1964 and 1973 Parking Supply	VII-6
VII-2	Butte Central Business District - Parking Surpluses and Deficiencies - 1973	VII-8
VII-3	Butte Central Business District - Parking Surpluses and Deficiencies - 1990	VII-12
VII-4	Parking Space Revenues	VII-17
VIII-1	Butte Bus Lines' Rolling Stock	VIII-4
VIII-2	Butte Bus Lines' Transit Schedule	VIII-8
VIII-3	Income and Expenses - Butte Bus Lines, 1965-1971	VIII-13
VIII-4	City Transit System - Income and Expenditures	VIII-15
IX-1	State Funding Allocations - Fiscal Years 1972 and 1973	IX-2
A-1	Traffic Signal Inventory	
A-2	1990 Total Origin and Destination Trips	

foreword



FOREWORD

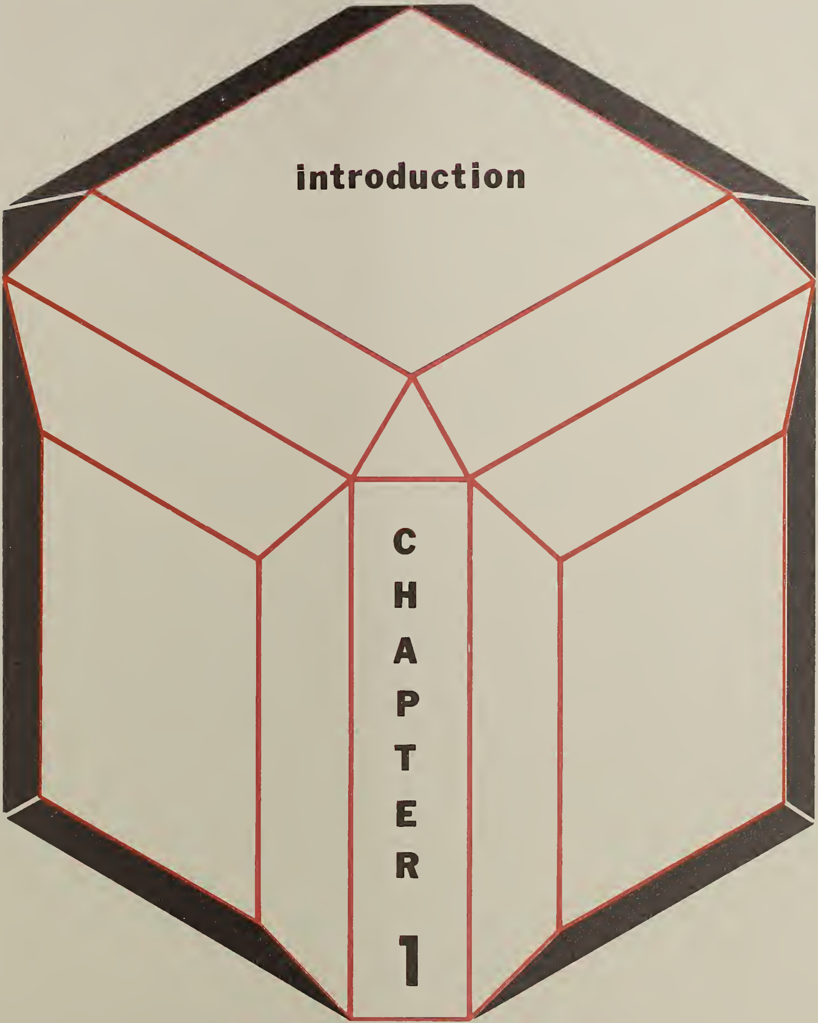
Butte - Silver Bow County presently faces a number of difficult planning problems. Valuable copper reserves lie beneath the central business district and the Anaconda Company has publicly stated that at some point in time they probably will be mined. Simultaneous with this transportation study, the City-County Planning Board is carrying out a comprehensive analysis to formulate a plan for revitalization and/or relocation of the existing uptown business district. A decision to relocate has not been made; nor is there a definite proposed location. Hence, the Transportation Policy Committee decided that for the purposes of this study, the future Land Use Plan should consider the central business district in its present location.

The Bert Mooney - Silver Bow County Airport is located within the Butte urban area, four (4) miles from the central business district. Residential and commercial development and surrounding mountains limit future expansion and the installation of an Instrument Landing System. Studies have been carried out to determine the feasibility of relocation to a new site. In January, 1973, the Butte - Silver Bow County Airport Commission adopted a plan to retain the present air facility location. This has been taken into consideration in the development of this transportation plan.

A third assumption was necessary prior to testing of alternate 1990 highway systems. U. S. Highway 91, extending north from Butte to Boulder and Helena, Montana, has been proposed as an alternate route for Interstate Route 15. Other alternate routes are under consideration by the Montana Department of Highways, and a decision is not expected until late 1973. Meanwhile, the Butte - Silver Bow City - County Planning Board requested that a route connection from Continental Drive to U. S. Highway 91 (and proposed Interstate Route 15) be analyzed in this transportation study. That route is referred to as the Columbia Gardens Interchange and Connector. Analyses in this report assume that Interstate Route 15 will follow U. S. Highway 91, and the interchange was tested. This assumption was established for testing purposes only, and is not necessarily the recommendation of the Consultant. It was not the purpose of this study to analyze alternate Interstate Route 15 routes.

introduction

CHAPTER 1



Chapter I

INTRODUCTION

The purpose of this phase of the Butte Urban Transportation Study has been to analyze future travel in the Butte metropolitan area, and to develop a plan for providing transportation facilities to meet the needs for the next twenty (20) years. As a guide, the City-County Planning Board has adopted a set of goals and objectives. These have been followed in the development of the Plan. Methods used in the study included analyses of existing travel patterns and land uses, forecasts of socio-economic variables and travel, calibration of transportation planning computer models, and the testing of alternative future highway networks.

During 1969, the Butte - Silver Bow City-County Planning Board began preparation of a Comprehensive Plan. Data was collected as a base for the development of a future land use plan, a thoroughfare plan, community facilities plan, and a public improvements program. To extend the use of these socio-economic data and to establish a detailed highway construction plan consistent with the Comprehensive Plan, the Planning Board requested that the Montana Department of Highways initiate a comprehensive transportation study. In the summer of 1970, the Department of Highways began collecting travel data through a series of surveys - the internal dwelling unit survey, external cordon line interviews, a truck survey and a taxi survey.

By March, 1972 the travel data had been manually edited, keypunched and verified. The Montana Department of Highways then contracted with Clete Daily and Associates to complete preparation of the transportation plan.

The Technical Advisory Committee and the consultant reviewed the transportation goals and objectives as set forth in the Major Thoroughfare Plan. That Plan established a course of action by defining a goal as:

> "an end toward which action is aimed, providing a direction to be traveled. In order to arrive at specifications for goals a plan must be converted to objectives, by the application of appropriate standards."

The specific transportation goals are summarized below:

* Arterial streets and expressways should not bisect, displace, or disrupt community facilities and areas of similar land use. Isolated parcels should not be created.

* Roadway facilities should be designed and constructed to serve the function desired, and be attractively landscaped so that nearby private properties will not be adversely affected.

* The transportation system should be correlated with planning and development of other elements of the Comprehensive Plan.

- The transportation system should endeavor to provide reasonable and direct access to all property and for the majority of anticipated trips.

- Turning movements and on-street parking should be prohibited where necessary to provide efficient and safe movement of motor vehicles.

- Roadways and parking facilities should be designed to accomodate forecasted traffic volumes.

- The adopted transportation system should be provided so that industrial and commercial traffic is kept off residential streets.

In order to attain these goals, the committee established the following objectives:

- Develop a transportation system which will effectively serve existing and anticipated travel demands.

- Develop a system which will provide acceptable levels of service while serving forecasted travel needs.

- Alleviate traffic congestion and reduce travel time between any two points in the urban area.

- Provide for increased travel safety.

- Provide a transportation system that is economical and efficient.

- Develop a plan which is aesthetically pleasing and has minimal impact on the environment.

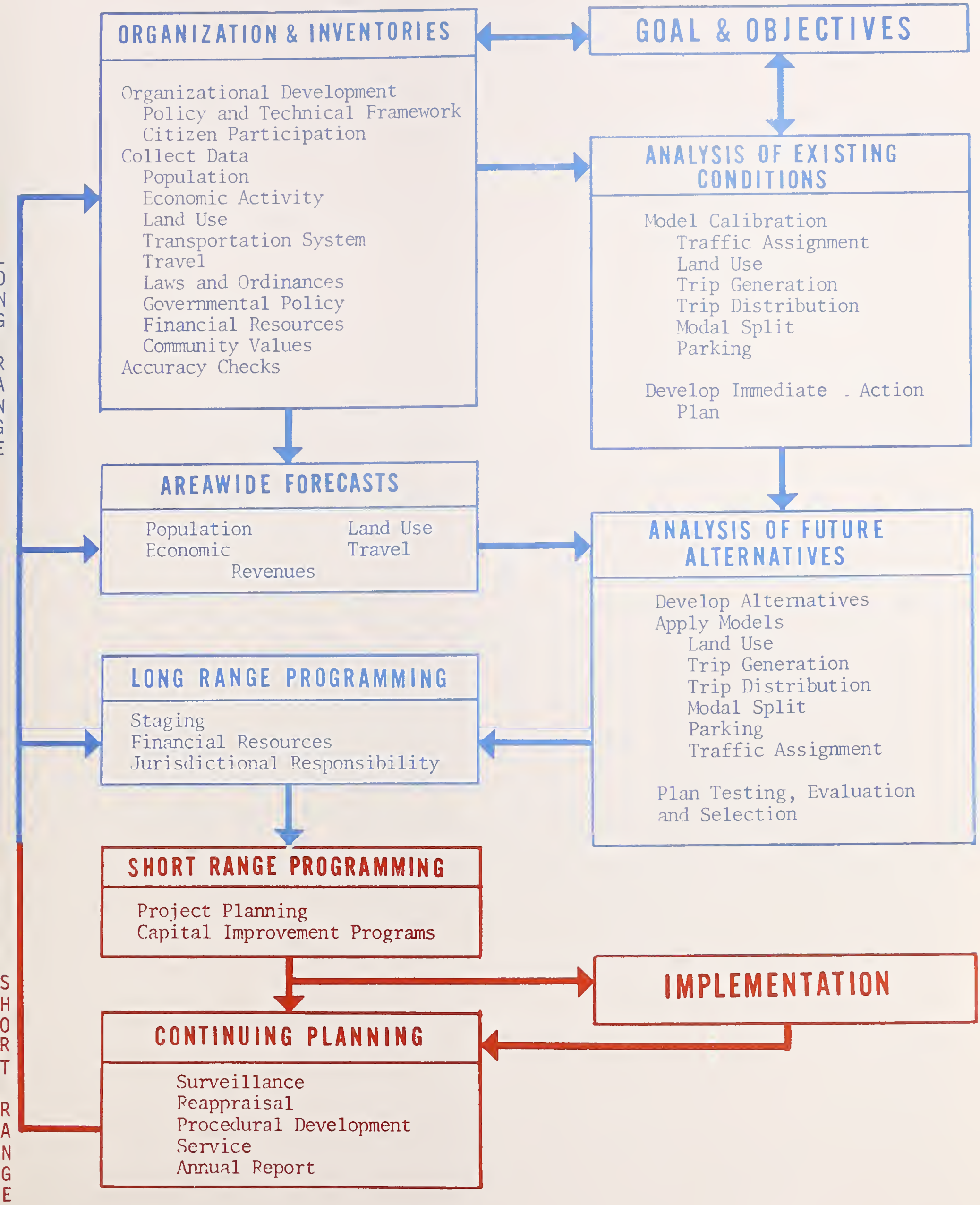
- Develop a plan that integrates use of all modes of transportation.

The development and adoption of a long-range transportation plan for the Butte urban area is the first step in the continuing, comprehensive and cooperative transportation planning process. Figure I-1 has been reproduced from the U. S. Department of Transportation's Urban Transportation Planning Manual to illustrate the planning steps. Note that the flow chart is divided into two (2) sections - long range and short range planning and programming. Work activities related to development of the long range plan have been completed in this study. The process must now continue into the short range programming phase with cooperative efforts between Butte - Silver Bow officials and technical personnel, areawide citizens, the Montana Department of Highways and the Federal Highway Administration.

Following publication of this plan, other reports may be prepared by the Montana Department of Highways or other agencies to reflect changes in employment, population, and land use trends. Significant departures from the socio-economic forecasts used in this study may require updating, resulting in the revision of the recommended transportation plan. To aid future adjustments and to provide a thorough understanding of all work activities leading to the preparation of this plan, three (3) technical reports have been published. They are as follows:

Figure I-1

THE URBAN TRANSPORTATION PLANNING PROCESS



Tech Plan Report Number 1: "Travel Surveys"

Tech Plan Report Number 2: "1970 Traffic Assignment, Trip Generation, Gravity Model Calibration"

Tech Plan Report Number 3: "Forecast Year: Land Use Distributions, Trip Generation, Traffic Assignment to Existing Plus Committed System"

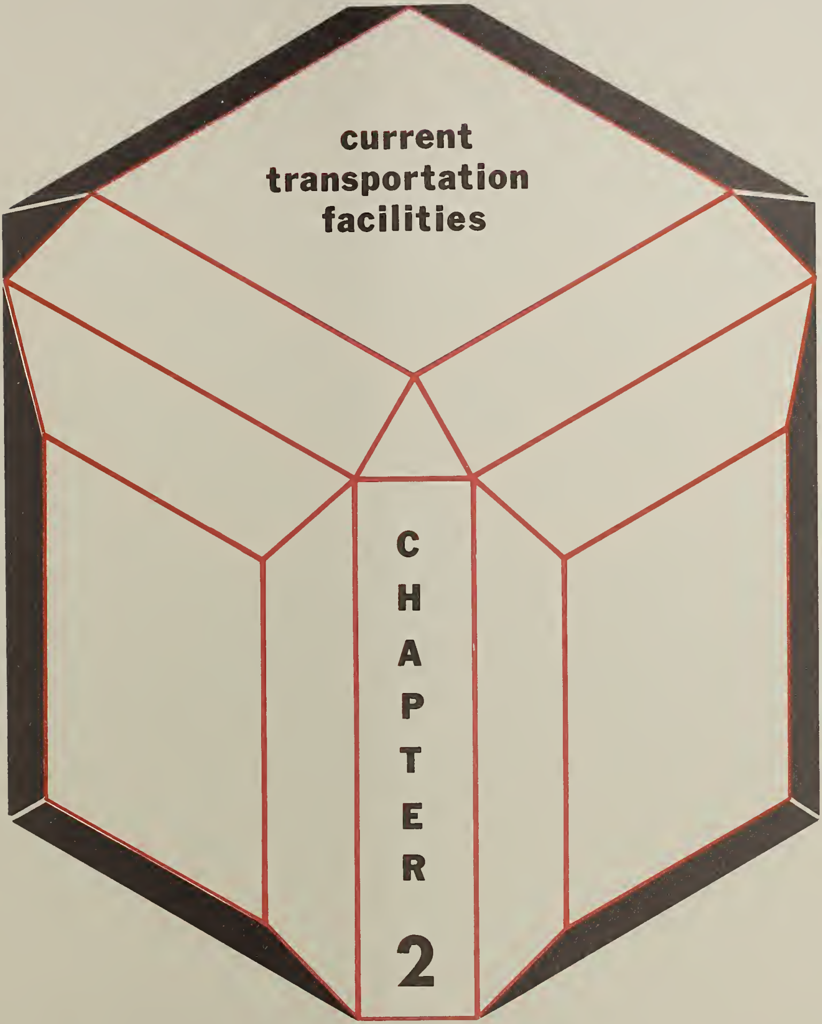
The purpose of these three reports was to document in detail all assumptions and the technical analyses. The purpose of this publication is to summarize the findings and to present the 1990 transportation plan recommendations in terms that can be understood by the layman.

This long range transportation plan consists of three parts:

- Recommended highway improvements;
- A Central Business District Parking Plan; and
- Recommendations designed to upgrade and assure continued operation of mass transit service.

Recommendations are described in Chapters VI, VII, and VIII, respectively.

A brief summary of the recommended highway improvements is presented in Figure VI-3. Additional unbound copies of this map are available for distribution.



current transportation facilities

CHAPTER 2

Chapter II

EXISTING TRANSPORTATION FACILITIES

The Butte urban area has a transportation system composed of highways, railroads, mass transit and airport facilities. It is a well balanced inter-modal system, as residents have the opportunity to travel throughout most of the area by either private automobile or mass transit. There are four (4) modes of transportation connecting the Butte urban area with state, national and international transportation systems. The backbone highway system includes both an east-west and a north-south interstate. AMTRAK passenger trains traverse Butte connecting such major cities as Seattle and Chicago. Intermountain Bus Lines serves Butte and provides connections to other major nation-wide lines. The Bert Mooney Silver Bow County Airport offers jet service to other Montana cities as well as national metropolitan centers.

Figure II-1 illustrates the location of the Butte urban area within the State of Montana. The urbanized area contains approximately 40,000 people, representing 5.8 percent of the state's population. It is the fourth largest metropolitan area in the state. Major highways, railroads, bus lines and airports are also shown. Relative to the rest of the state, the Butte area has good transportation

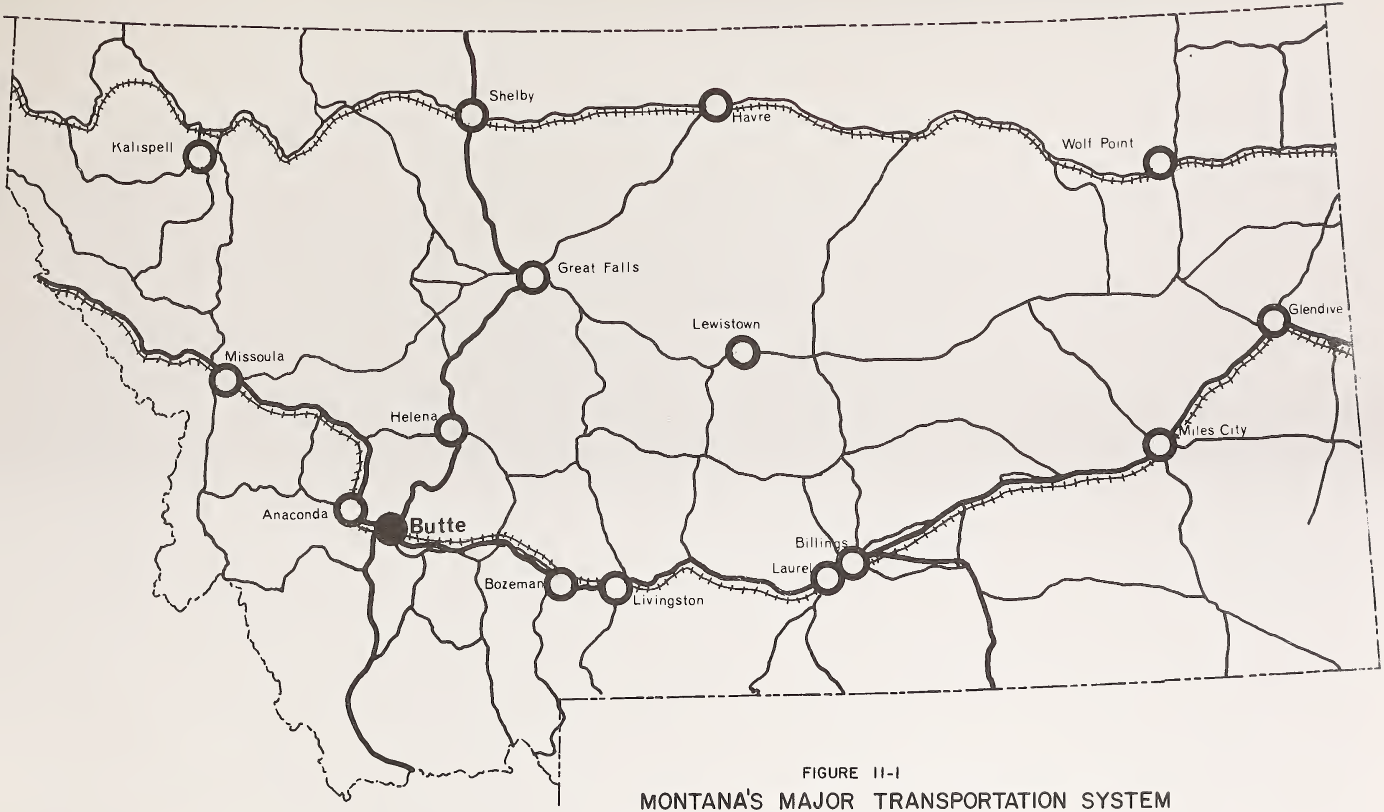


FIGURE II-I
MONTANA'S MAJOR TRANSPORTATION SYSTEM

access to/from other urban and rural areas. This has resulted in Butte's designation as an international port of entry.

HIGHWAYS

Mileage

There are a total of 3,758,942 miles of roads and streets in the United States and the District of Columbia. Montana contains 77,920 miles or 2.1 percent of the total. It is interesting to note that this mileage percentage is comparable to that of some of the more densely populated states. Table II-1 shows that Montana has nearly the same mileage as the State of Washington and is only slightly less than New York and Ohio. At the same time, population figures are significantly less than for those same states. The miles of roads per person are about ten times greater in Montana. For this reason, it is difficult for Montana's tax base to support maintenance of the road system at a level comparable with other states.

Table II-1

COMPARISON OF POPULATION AND ROAD MILEAGE PER STATE

1970 Population Rank	Area	1970 Population	Mileage Number	Mileage %	Miles/Person
-	United States	203,200,000	3,758,942	100.0	0.01850
1	California	19,953,134	165,990	4.4	0.00832
2	New York	18,241,266	106,490	2.8	0.00584
3	Pennsylvania	11,793,909	115,658	3.1	0.00981
10	Ohio	10,652,017	109,240	2.9	0.01025
22	Washington	3,409,169	80,219	2.1	0.02353
38	Maine	999,663	21,424	0.6	0.02143
44	Montana	694,409	77,920	2.1	0.11221
49	Wyoming	332,416	40,540	1.1	0.12195
50	Alaska	302,173	7,817	0.2	0.02587

Source: U.S. Department of Transportation, Federal Highway Administration Newsletter, November 22, 1972.
1970 U. S. Bureau of the Census

Mileage in Silver Bow County is significantly less than for the other six counties in the state with over 30,000 people. Silver Bow County mileage represents 0.7 percent of the state's total, whereas the remaining six counties average 2.4 percent. Table II-2 shows that municipal mileage per county is comparable, and the primary difference lies in rural areas.

Table II-2

COMPARISON OF POPULATION AND ROAD MILEAGE PER COUNTY

	Population		Mileage				
County	Total	% Rural	Rural	Municipal	Total	%	Miles/Person
Yellowstone	87,367	13.4	1,878	290	2,168	2.8	0.0248
Cascade	81,804	13.3	1,871	277	2,148	2.7	0.0263
Missoula	58,263	25.3	1,661	157	1,818	2.3	0.0312
Silver Bow	41,981	19.0	469	100	569	0.7	0.0135
Flathead	39,460	58.1	2,014	76	2,090	2.7	0.0530
Lewis & Clark	33,281	31.7	1,516	155	1,671	2.1	0.0502
Gallatin	32,505	42.6	1,587	125	1,712	2.2	0.0527

Source: U. S. Department of Transportation, Federal Highway Administration Newsletter, November 22, 1972

1970 U. S. Bureau of the Census.

The significance of the above comparison is that the population in Silver Bow County is mostly urban - surpassed only by Yellowstone and Cascade Counties. The ratio of the number of miles per person is the lowest for these seven most populated counties. Since the county's share of gas tax monies is based on population, Silver Bow County is in a better position to maintain it's roadways than the other populated counties.

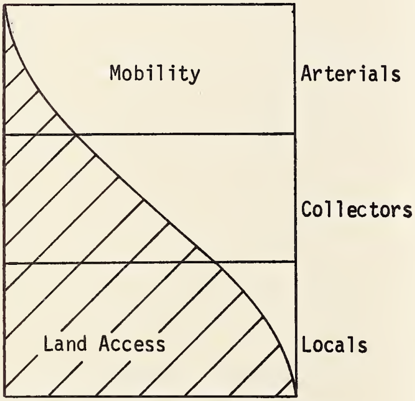
Functional Classification

Roadways in the Butte area have been functionally classified by the Montana Department of Highways according to guidelines established by the Federal Highway Administration of the U. S. Department of Transportation. Two classifications were made - the first considered the 1968 system, comparing the existing Federal aid system with functional usage of existing facilities. The second classification was based on 1990 projections and was used to determine future highway needs.

Highways must serve both local land access and traffic mobility. These two functions are in direct conflict. Functional classification assigns specific functions to each street or highway in the system. Arterials provide high mobility, serving as the principal network for high traffic volumes; they connect with major traffic generators, freeways and major expressways. Because of high volumes, local access should be limited. The function of collector routes is to accept traffic from small businesses and residential streets and effectively funnel vehicles to arterials. Access and mobility should be balanced. Local streets are just as important to the overall

FIGURE II-2

Relationship of Functionally
Classified Systems in Serving
Traffic Mobility and Land Access
PROPORTION OF SERVICE



Source: 1968 National Highway Functional Classification Study Manual transportation system as major arterials. Their function is to serve the individual motorist and provide him safe and convenient movement to/from his residence. Land access should be the primary consideration. Figure II-2 graphically illustrates the degree of usage for functionally classified routes in serving land access and mobility.

The 1968 Functional Classification Map has been reviewed, and because of the Berkley Pit Bypass (completed in 1971), a revision is necessary. The recommended 1973 classification map is illustrated in Figure II-3.

1973 Traffic Volumes

Periodic traffic counts have been conducted in the Butte urban area by the Montana Department of Highways. Counts for the years 1969 through 1973 were analyzed and used to compile two maps illustrating 1973 average daily traffic. Figure II-4, with the attached enlargement of the business district, shows traffic flow for the urban area.

Seven (7) count stations were established in 1970, along a screenline bisecting the Butte study area. Counts have been made at these stations each year since 1970. During 1970, the total average daily traffic of all stations was 45,218, compared to 49,976 vehicles per day in 1973. The three year increase is 4,758 vehicle trips, or 10.52 percent. This is an average yearly increase of 3.51 percent per year. Each individual count station has shown some variations from the average.

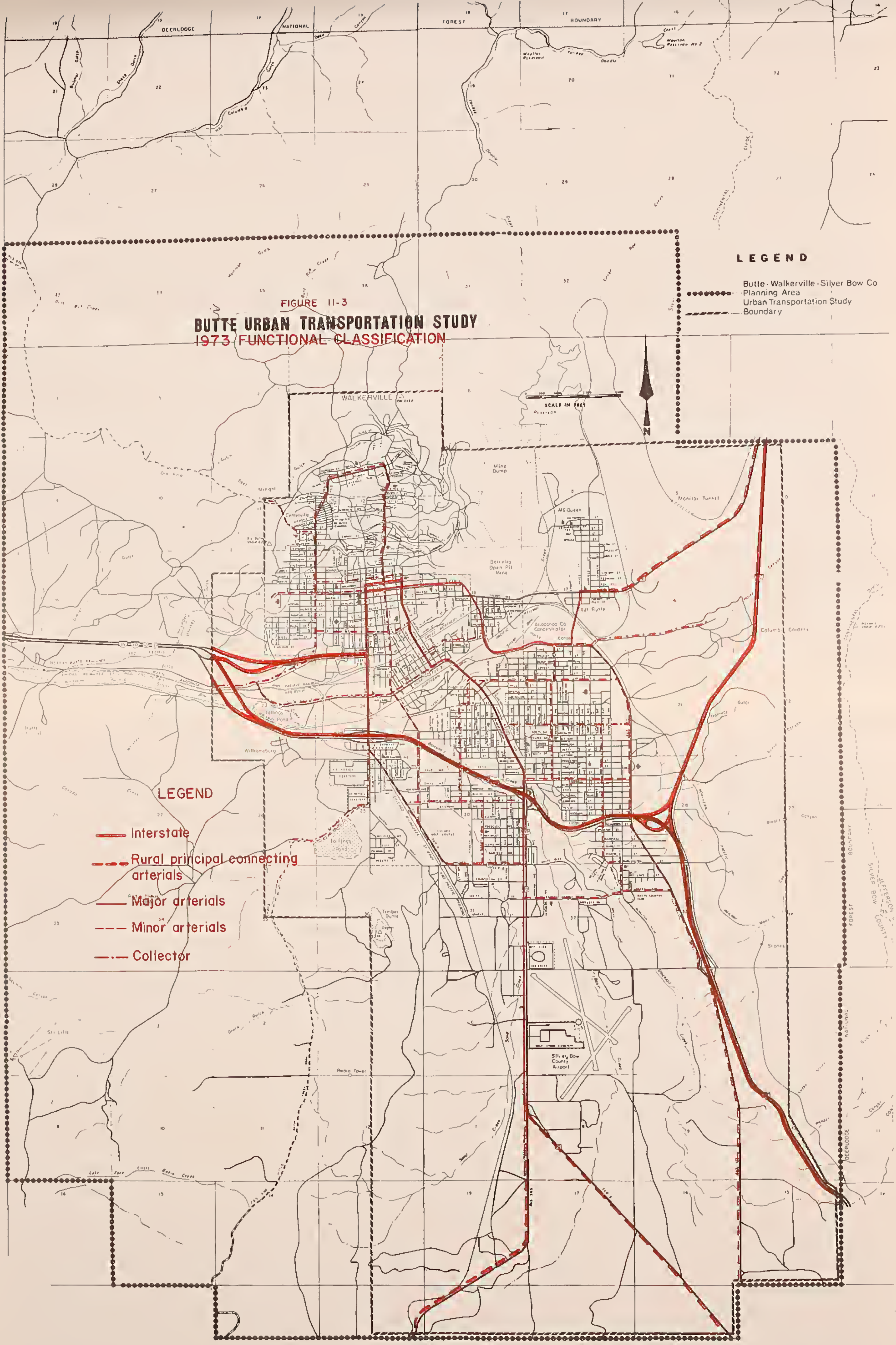


FIGURE II-3

BUTTE URBAN TRANSPORTATION STUDY

1973 FUNCTIONAL CLASSIFICATION

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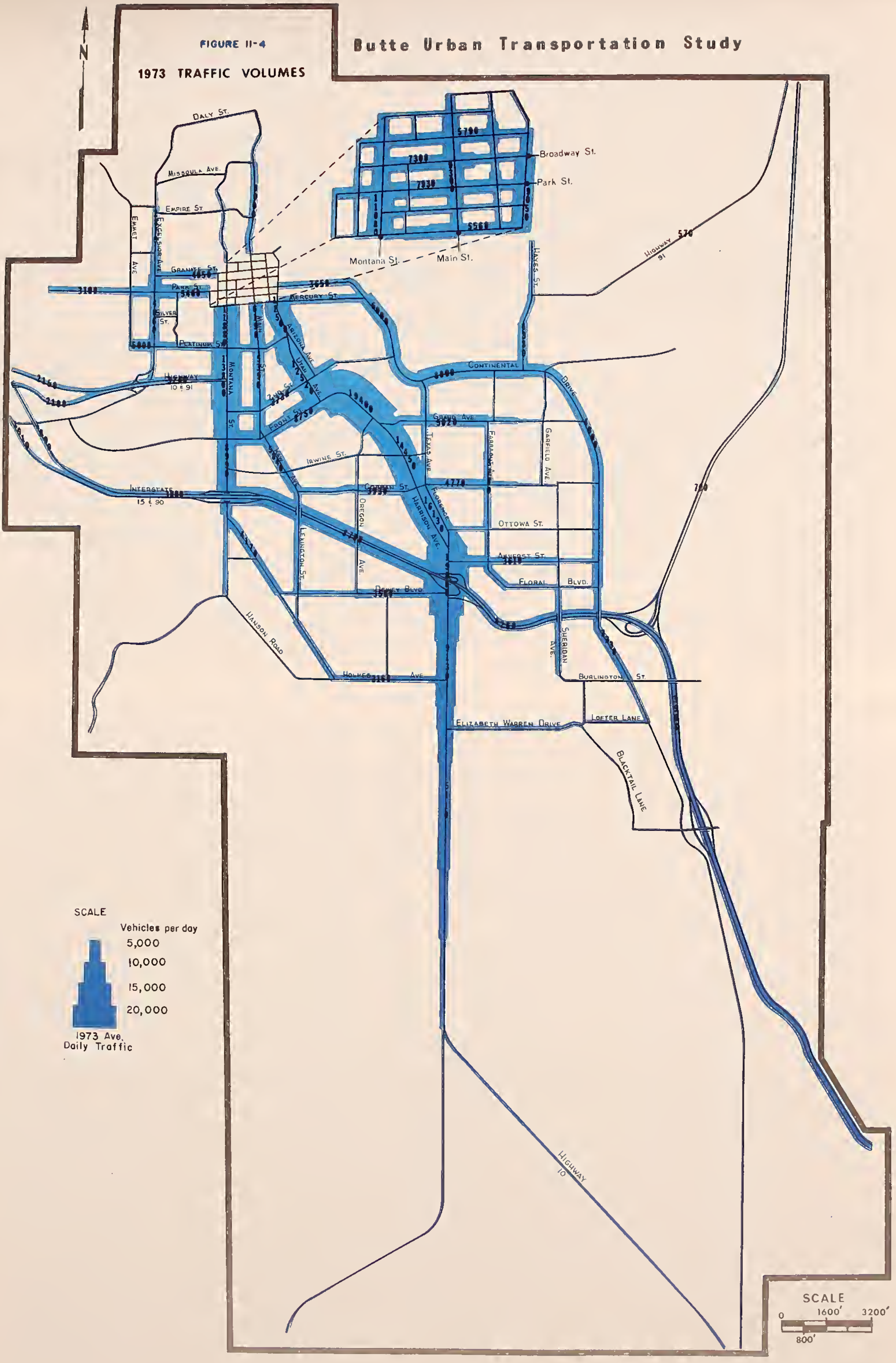
Butte Urban Transportation Study

FIGURE II-4

1973 TRAFFIC VOLUMES



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The two interstate crossings are increasing at a rate of between seven (7) and eight (8) percent per year. Montana Street, just north of IR15-90, showed a forty (40) percent gain following widening and reconstruction in 1969. Since 1970, the increase per year has been about three (3) percent annually. Traffic on Kaw Avenue south of Front Street has consistently decreased at about five (5) percent per annum. This is due to improvement of Montana Street and increased use of IR15-90 between Montana Street and Harrison Avenue. Harrison Avenue near the Civic Center is increasing slightly above the average at about 4.5 percent per annum. The remaining two screenline stations are not individually representative of trends due to relocation of the Berkley Pit By-Pass in 1971.

Traffic Signals

The Butte urban area has thirty-eight (38) signals and seven (7) flashing beacons. Their locations and type of operation are shown in Figure II-5. For additional detail regarding controller manufacturer, number of dials, model number, approximate equipment age, and number of signal head indications per approach, refer to Table A-1 in the Appendix.

Age of the signal equipment varies from about eighteen (18) years to three (3) years. In 1970, twenty-four (24) signals were updated by a Federal 9999 project. They are located in the central business district, and along Montana Street, Front Street, Utah Avenue and Harrison Avenue.

The Manual on Uniform Traffic Control Devices states that each approach direction shall have a minimum of two (2) signal faces. Nine

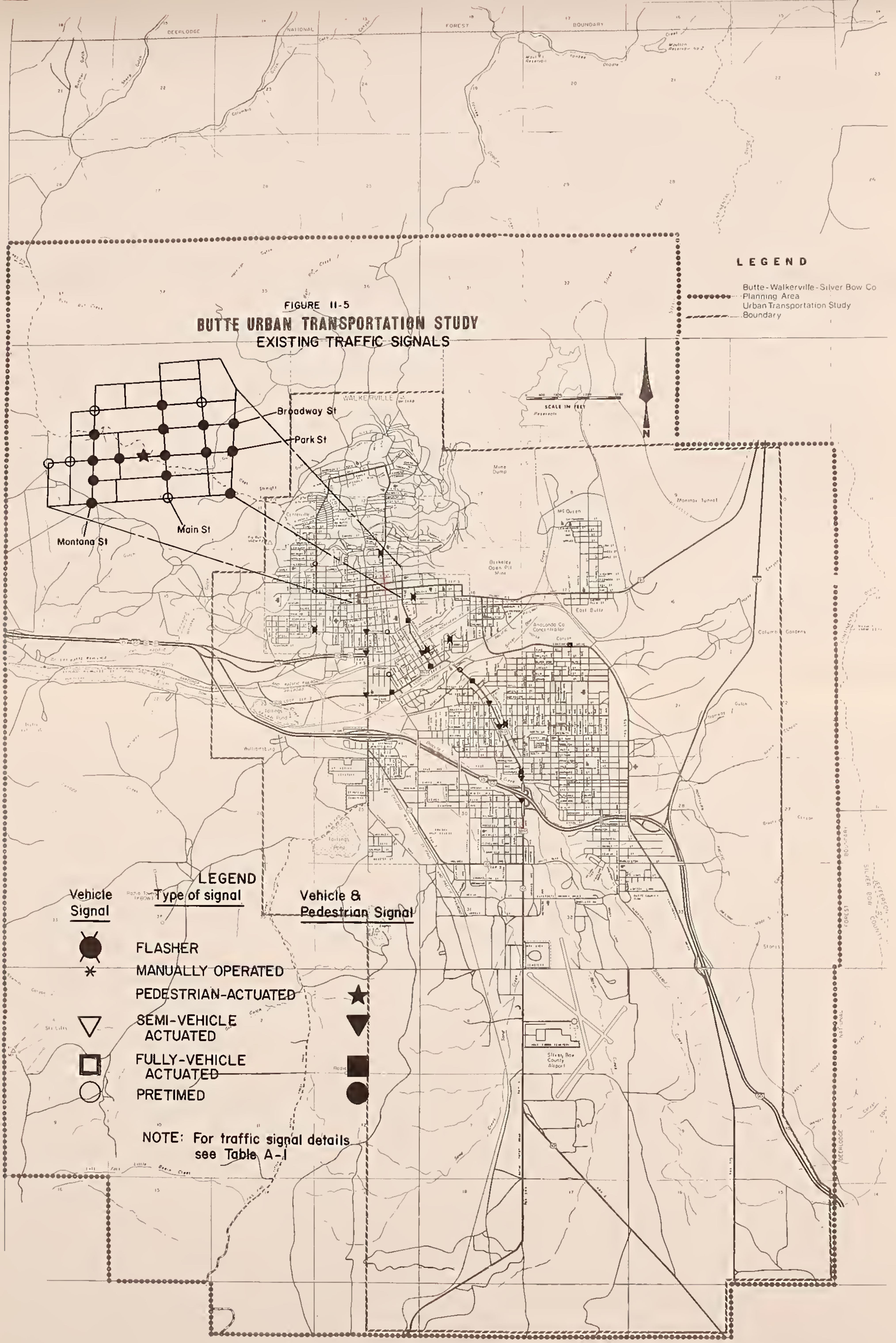

FIGURE II-5

BUTTE URBAN TRANSPORTATION STUDY

EXISTING TRAFFIC SIGNALS

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(9) intersections have only one (1) face per direction. Table II-3 identifies the location of the deficient signals and recommended improvements.

Table II-3

SIGNALIZED INTERSECTIONS WITH ONE SIGNAL FACE PER APPROACH

Deficient Signal Locations	Recommended Improvements
Montana St. & Granite St.	Upgrade signal; see Chapter VI.
Granite St. & Wyoming St.	Upgrade signal; see Chapter VI.
Park St. & Excelsior Ave.	Park St. from Excelsior St. to Montana St. recommended for reconstruction to four lanes. Detailed counts should be examined during design.
Park St. & Washington St.	
Park St. & Idaho St.	
Main St. & Mercury St.	Upgrade signal; see Chapter VI.
Platinum St. & Main St.	Upgrade signal; see Chapter VI.
Second St. & Main St.	Intersection reconstruction; see Chapter VI.
Excelsior St. & Caledonia St.	Signal does not satisfy traffic warrants; City-County Planning Board requests further investigation by Highway Department prior to signal removal.

Traffic Accidents

The Montana Department of Highways collected data on traffic accidents in the Butte urban area for the years 1969, 1970, and 1971. Collision diagrams were prepared for the twenty-three (23) intersections having the highest number of accidents during the three (3) year period. They are identified in Table II-4 in order of decreasing accident rate.

Information from Table II-4 is not entirely conclusive because the Federal 9999 signal improvement project was completed in December, 1970. Sixteen (16) of these locations were upgraded at that time,

Table II-4

1969-1971 INTERSECTION ACCIDENT SUMMARY

Number of Accidents by Type

Intersection	Total Approach Volume	Angle	Head on	Rear end	Side Swipe	Turning Movement	Parking	Non-collision	Fixed object	Pedestrian	Backing	Miscellaneous	Total Accidents 1969-1971	Average No. Accidents Per Year	No. Accidents Per Million Vehicles	Remarks
Main and Park	14630	8	-	10	5	1	-	-	-	-	9	4	47	15.67	2.94	Signal improved end of 1970.
Main and Mercury	12770	13	-	11	7	8	-	-	-	-	1	-	40	13.33	2.86	Upgrade signal; see Chapter VI.
Main and Galena	10550	5	-	11	2	3	-	-	-	-	4	2	27	9.00	2.34	Signal improved end of 1970.
Excelsior and Park	8710	2	1	10	2	2	-	-	1	1	1	2	22	7.33	2.31	Signal improved end of 1970.
Main and Platinum	10540	11	-	6	1	4	-	-	-	1	-	2	25	8.33	2.16	Committed Street Improvement.
Utan, Arizona, Platinum	14525	8	-	13	3	10	-	-	-	-	-	-	34	11.33	2.14	Upgrade signal; see Chapter VI.
Broadway and Wyoming	6880	1	2	7	4	-	-	-	-	-	2	-	16	5.33	2.12	---------------
Utah and Second	16210	8	2	18	-	6	-	-	1	1	-	1	37	12.33	2.08	Signal improved end of 1970.
Main and Broadway	12125	7	-	5	2	3	-	-	-	1	3	4	25	8.33	1.89	Signal improved end of 1970.
Wyoming and Park	11285	4	-	5	1	6	-	-	1	1	-	4	22	7.33	1.78	Signal improved end of 1970
Montana and Broadway	12295	4	-	5	1	7	-	-	-	-	4	2	23	7.67	1.76	---------------
Harrison and Cobban	18850	6	1	12	2	13	-	-	-	-	1	1	36	12.00	1.75	Signal improved end of 1970.
Platinum and Montana	16970	7	2	5	1	10	-	-	1	-	2	-	28	9.33	1.51	Signal improved end of 1970.

Table II-4 (continued)

1969-1971 INTERSECTION ACCIDENT SUMMARY

Intersection	Total Approach Volume	Number of Accidents by Type Angle	Head on	Rear end	Side swipe	Turning Movement	Parking	Non-collision	Fixed object	Pedestrian	Backing	Miscellaneous	Total Accidents 1969-1971	Average No. Accidents Per Year	No. Accidents Per Million Vehicles	Remarks
Broadway and Arizona	8690	1	1	3	-	4	-	-	-	2	3	-	14	4.67	1.47	--------------
Montana and Mercury	13625	10	-	5	-	3	-	-	-	-	1	2	21	7.00	1.41	Signal improved end of 1970.
Mercury and Arizona	16410	5	-	5	2	12	-	-	-	-	1	-	25	8.33	1.39	Signal improved end of 1970.
Montana and Park	10600	2	-	3	1	6	-	-	1	-	2	-	15	5.00	1.29	Signal improved end of 1970.
Montana and Granite	11240	2	-	5	-	1	-	-	-	-	6	1	15	5.00	1.22	Signal improved end of 1970.
Kaw and Front	12700	5	-	7	-	5	-	-	-	-	-	-	17	5.67	1.22	Signal improved end of 1970.
Arizona and Park	15330	3	1	9	-	2	-	-	-	2	2	-	19	6.33	1.16	Signal improved end of 1970.
Granite and Main	12700	-	-	4	1	2	-	-	-	-	7	1	15	5.00	1.08	Signal improved end of 1970.
Utah and Front	19195	-	1	8	-	5	-	-	1	1	1	1	18	6.00	0.86	Signal improved end of 1970.
Harrison and Dewey	20070	1	-	7	1	5	-	-	-	2	-	-	16	5.33	0.73	Signal improved end of 1970.
Totals	----	113	11	174	41	122	1	0	6	12	50	27	557	185.66	----	--------------

and the collision diagrams indicated that the number of accidents were reduced in 1971. Three (3) locations proposed for upgrading in this Plan are discussed in Chapter VI.

The intersection of Excelsior Street and Park Street, listed as fourth highest, shows ten (10) rear end accidents, six (6) of which occurred on the north approach. The steep downgrade on this approach restricts the north approach sight distances and there is only one (1) signal head at each approach. Turning counts conducted during 1971 indicate that the traffic signal warrants were not satisfied. This intersection is within the section of Park Street committed for reconstruction in January, 1974; the need for a traffic signal should be examined in detail during design.

The remaining three (3) high accident intersections are within the central business district along Broadway Street. A conclusive pattern was not determined from the accident collision diagrams; however, buildings along Broadway Street are near to corners restricting the sight distance. In most cases, parking is permitted to within a few feet of marked crosswalks. The Manual on Uniform Traffic Control Devices recommends prohibited parking for thirty (30) feet behind a crosswalk on the approach side and for twenty (20) feet beyond a crosswalk on the departure side of a signalized intersection. This recommendation should be implemented throughout the urban area. This would open up the intersections along Broadway Street.

Service Volumes

Using 1972 physical and operational characteristics, peak hour service volumes at Level of Service C, which represent stable flow with relatively satisfactory operating speeds, were calculated for each signalized intersection in the study area. These were compared with the traffic counts (i.e. demand volumes) on each approach during the same time period. Ratios of demand volume to service volume (DV/SV) were found. Since no locations were identified where the ratio equaled or exceeded 1.00, it was concluded that the service rendered by Butte area roadways is generally adequate. However, there are locations where major traffic conflicts exist; these will be discussed in Chapter VI under the Recommended Transportation Plan.

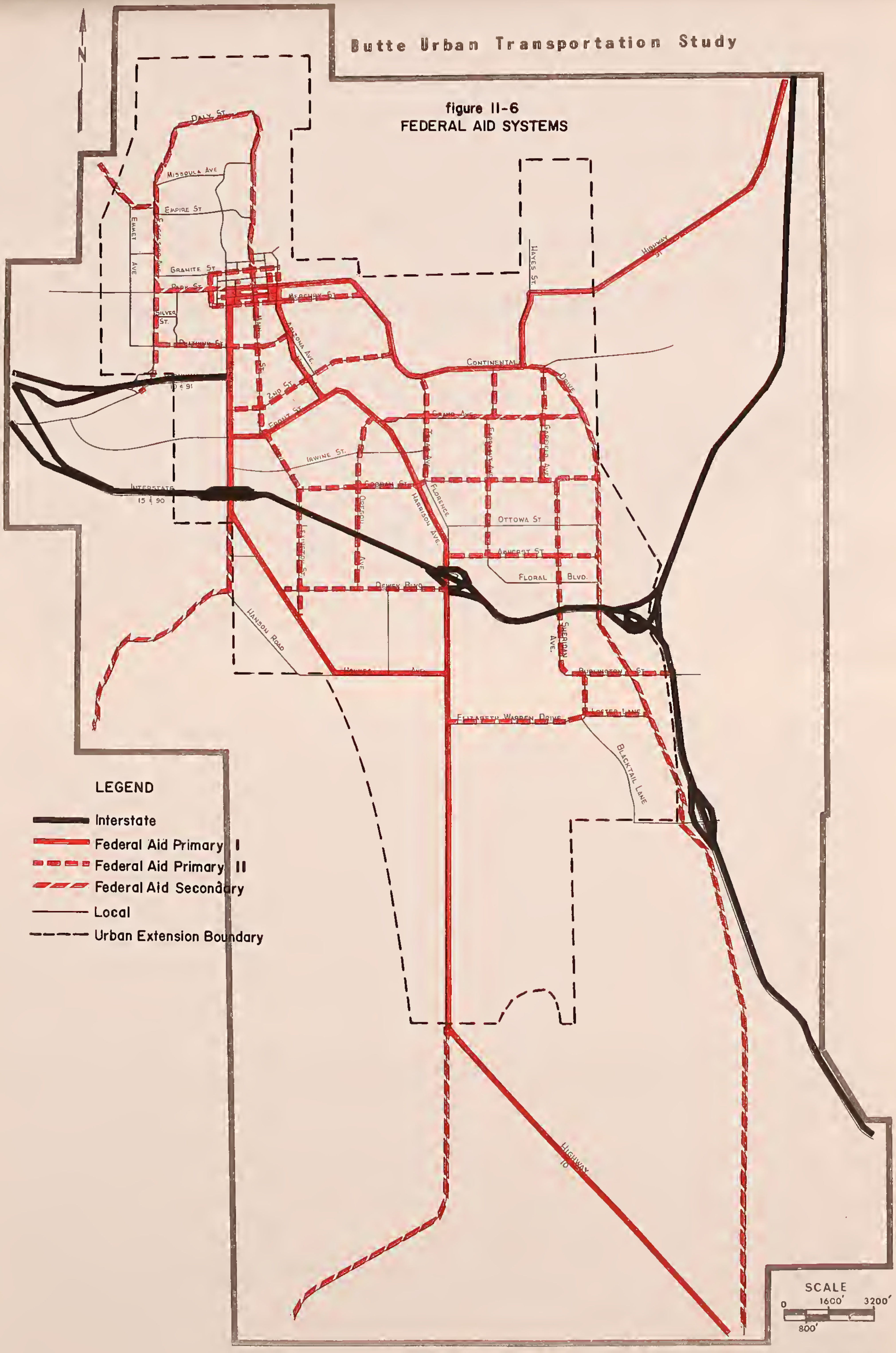
Federal Aid System

Figure II-6 illustrates the existing Federal Aid Highway Systems and a recommended Federal Aid TOPICS System. Mileage for each within the transportation study are tabulated in Table II-5.

Travel Time

Using average highway running speeds for all collectors, arterials and expressways, isochronal maps showing the travel time from the central business district were plotted for each peak travel period and the daily

figure II-6
FEDERAL AID SYSTEMS



CLETE DAILY AND ASSOCIATES
Helena, Montana

average. Isochronal lines for the different time periods of the day were similar, indicating that peak hour congestion is negligible or that its duration is extremely short and was not measured in the travel time inventories.

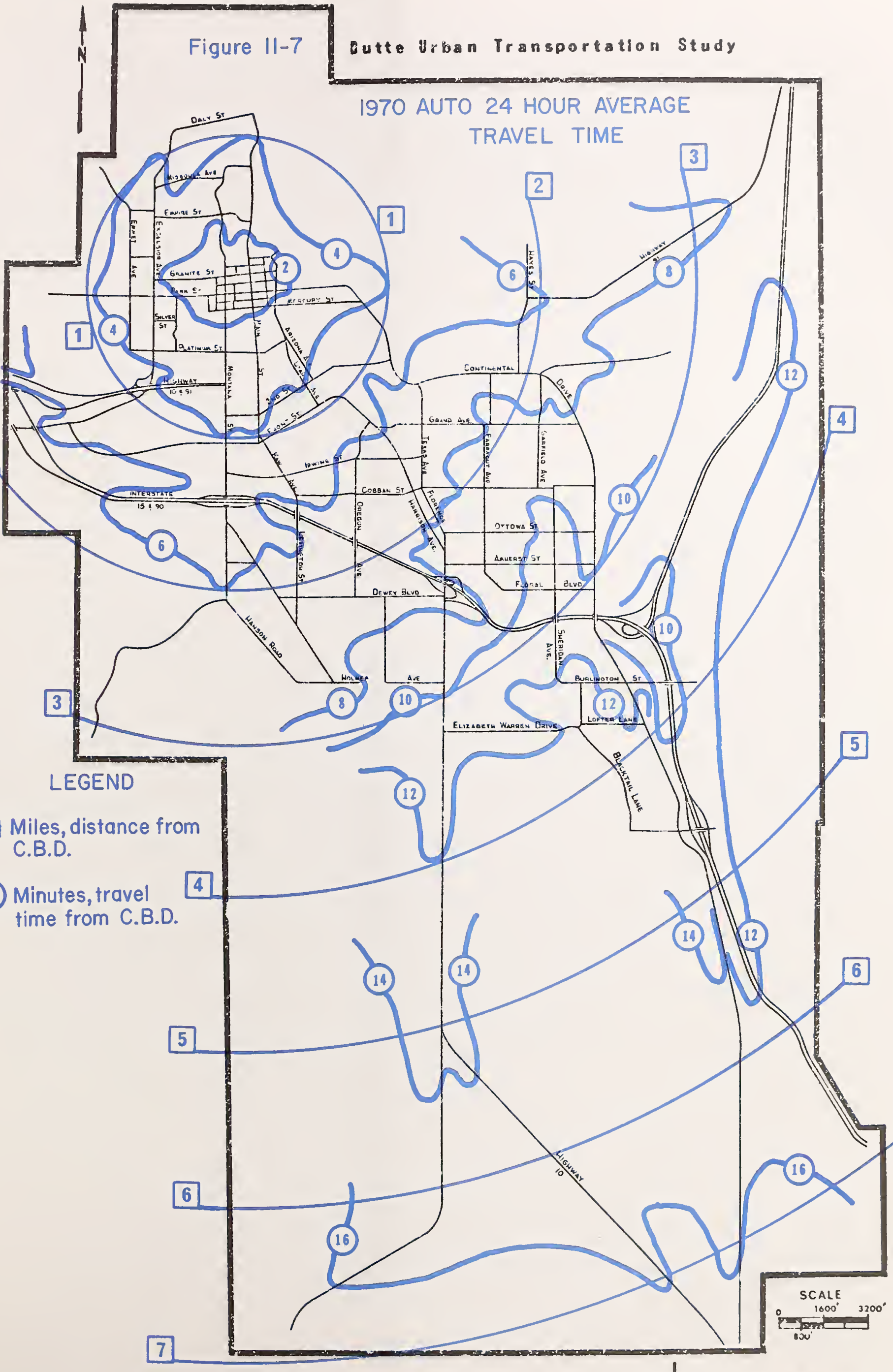
Results of the 1970 twenty-four (24) hour average travel time inventory are shown in Figure II-7. Isochronal lines indicate that the furthest point from the central business district in the transportation study area, requires sixteen (16) minutes travel. The map also reveals that the interstate route is the fastest means of ground travel in the area. If area residents would use the section of interstate between Harrison Avenue and Montana Street for local access, their overall travel time would decrease and traffic volumes on the major arterials would be reduced.

RAILROADS

AMTRAK passenger trains provide east-west service along two corridors in Montana. Both lines operate on the Burlington Northern Railroad system. The northern route provides daily service along the former Great Northern Railroad line, connecting Whitefish, Glacier Park, Shelby and Havre. A second line, referred to as the southern route operates on the former Northern Pacific Railroad and connects Missoula, Butte, Bozeman and Billings. Figure II-1 illustrates AMTRAK passenger train routes within Montana.

This transportation study is primarily concerned with the existing and future operation of the highway system and transit lines in the Butte urban area. No attempt was made to determine adequacy of the existing railroad service or to set forth recommendations.

Figure II-7



1970 AUTO 24 HOUR AVERAGE TRAVEL TIME

LEGEND

- 0 Miles, distance from C.B.D.
- 00 Minutes, travel time from C.B.D.

CLETE DAILY AND ASSOCIATES
Helena Montana

BUSES

Intermountain Bus Lines and Greyhound Bus Lines provide interstate transit service for the Butte area. Intermountain Lines provides service to Missoula and Kalispell twice daily, three (3) trips to Helena, and three (3) buses southbound to Idaho Falls, Idaho. Greyhound operates in each direction, but provides the only service eastbound. Major bus routes are shown in Figure II-1. Chapter VIII presents detailed analyses of the local transit system.

AIR SERVICE

The existing Bert Mooney Silver Bow County Airport is located within the Butte urban area four (4) miles from the central business district. Capacities of the runways are limited due to nearby residential and commercial development. It is impossible to establish Instrument Landing Systems because of nearby mountains. For these reasons the Silver Bow County Airport Commission contracted with Morrison - Maierle, Inc. of Helena, Montana to investigate the feasibility of relocating the present airport to a new site.

Recommendations from the feasibility study called for:

- "limiting expansion at the present airport to upgrading existing facilities and construction of safety items for period 1972-1980, unless positive assurance can be obtained that an ILS will not be required."
- "Construction of a new airport at Stauffer Chemical ----"*

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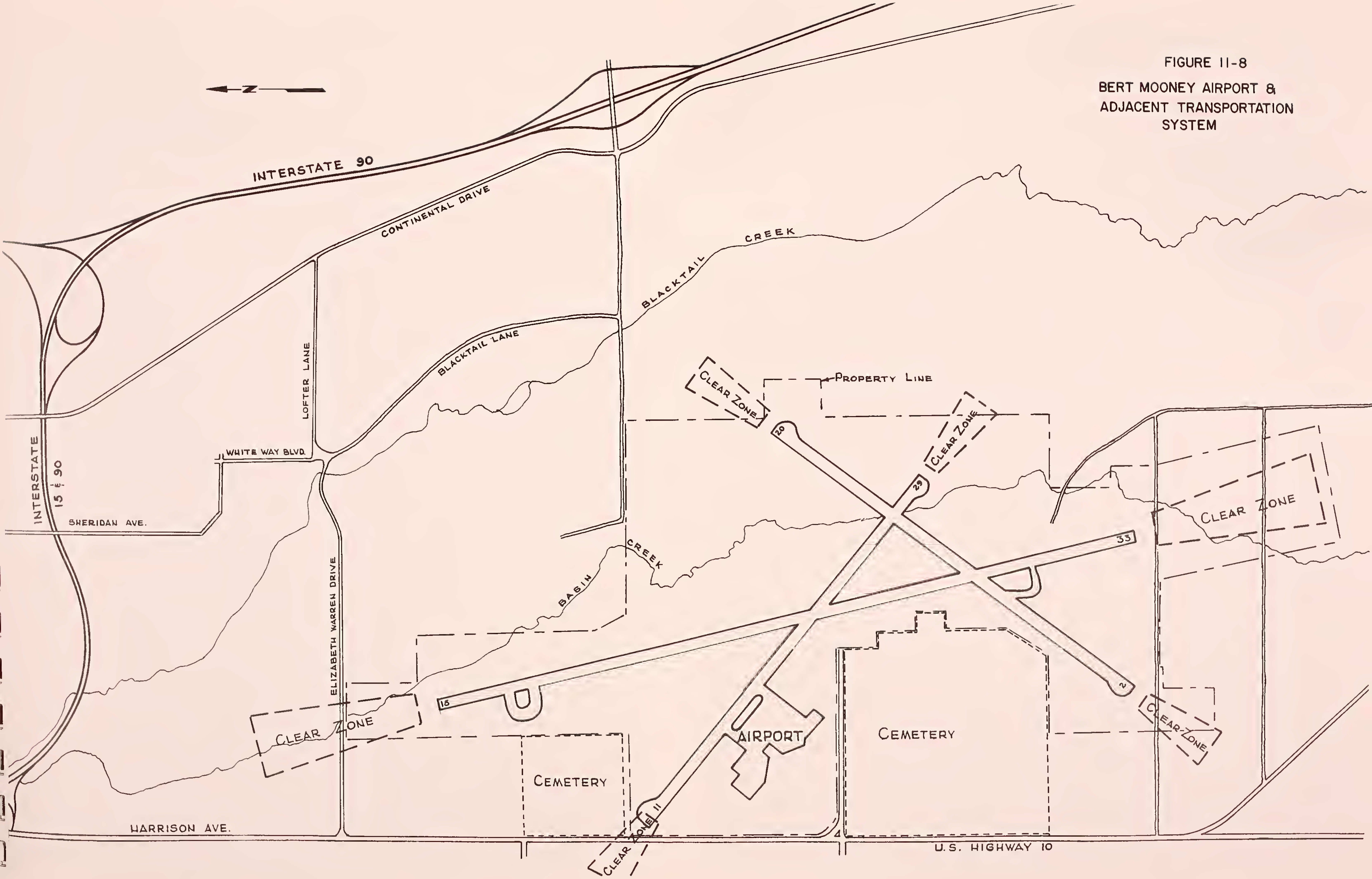
* Morrison - Maierle, Inc. Airport Site Feasibility Study - Silver Bow County Airport; Table 20, p. 43 (1972).

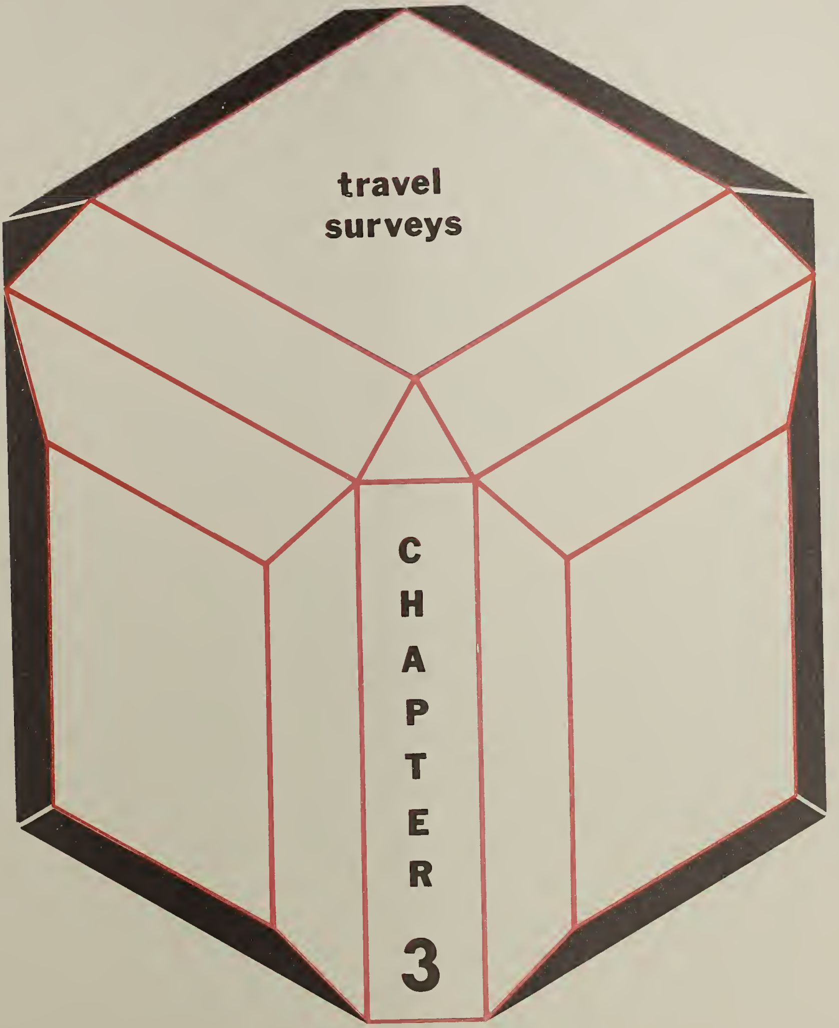
In January, 1973, the airport commission voted to retain the present airport location and to continue investigation of the recommended new site and possible sources of funding.

Figure II-8 is reproduced in part from the Airport Site Feasibility Study. Illustrated are existing runways, terminal facilities, and surrounding roadways. There is discussion of extending runway 15-33 fifteen hundred (1,500) feet to the north which would require either closure or relocation of Elizabeth Warren Drive. Since it was assumed that the airport would not be relocated, the recommended transportation plan considers the effects of the proposed runway extension.

FIGURE 11-8

BERT MOONEY AIRPORT & ADJACENT TRANSPORTATION SYSTEM





CHAPTER 3

travel surveys

Chapter III

TRAVEL SURVEYS

During the summer and fall of 1971, the Montana Department of Highways conducted a series of travel surveys to determine travel characteristics in the Butte urban area. They were: the home interview survey, the truck survey, the taxi survey, and the external survey. Data from each survey was combined onto one computer tape to obtain a total summary of the origins and destinations of daily travel in the Butte area. The purpose of this chapter is to briefly describe each survey and to point out the resulting trip characteristics.

HOME INTERVIEW SURVEY

Using a listing of dwelling units from the land use inventory and a set of detailed maps showing individual parcels, a random twenty (20) percent sample of households was chosen for interview. Each of the selected units was contacted to determine population and employment characteristics and the origins and destinations of all trips made by each family member during the previous day. To arrive at the total universe of socio-economic data and travel information, expansion factors were calculated and applied to the sampled data.

The study area was subdivided into one hundred fifteen (115) analysis zones. A separate expansion factor was developed for each zone, and was based on the comparison of single and multiple households as obtained in the 1970 U. S. Census data to those sampled in the home interview survey. Application of these factors to the sample data yielded a study area population of 39,433, or 93.9 percent of the 1970 population of Silver Bow County.* There were 13,680 occupied and 1,385 vacant households in the Butte urban area at the time of the surveys.

The home interview survey sampled all auto driver trips made by residents of a household. This includes trips extending outside the study area boundaries (external trips) taxi trips, through trips that may have stopped at a dwelling unit, and truck trips. Since there were separate surveys to cover truck trips, taxi trips and external trips, only internal trips were used from the home interview survey. Results yielded 66,555 internal trips originating from or destined to a household and another 25,102 internal trips with neither origin nor destination at a household. There was a total of 91,657 internal trips, or 81.6 percent of the total study area daily travel.

TRUCK SURVEY

Truck registration files for Silver Bow County were used to select a random, one-third sample for interviewing. The trip log for a complete day was obtained for each truck selected. These trips were expanded to represent a one hundred percent (100%) sampling of internal truck trips. Results indicated 888 trucks in the study area making 4,973 trips per day, or 5.6 trips per truck. Those 4,973 trips represent 4.4 percent of the daily travel.

---

* United States Bureau of Census, 1970.

TAXI SURVEY

There are two (2) taxi companies operating in the Butte urban area. They are the City Taxi Company and the Owl Cab Company. Both companies record the origin and destination of all trips made by each taxi. For this reason, it was not necessary to select a sampling of trips. One hundred percent (100%) of the trips made were available.

The taxi survey yielded 1,676 trips per day, which is 1.5 percent of the daily travel. This percentage is somewhat higher than for other Montana cities. Billings, Great Falls, Helena and Missoula each indicated that taxi trips represented less than 1.0 percent of total daily travel. This higher percentage is due to a large population of retired persons and a large number of households with no autos owned.

EXTERNAL SURVEY

There are eight (8) roadways crossing the study area boundaries. Two (2) of these are on the interstate and a third is located along U.S. Highway 91 northeast of Butte. Four (4) other external stations are located along either Federal Aid Primary or Secondary Routes. The eighth route, extending west of Butte to Rocker, is the only non-federal aid route crossing the study area boundary.

The Montana Department of Highways examined each of these stations to determine the need for a traffic field survey. It was found that six (6) stations carried 98.9 percent of the traffic crossing the study area boundaries. The remaining 1.1 percent, or 196 vehicles per day were carried by the two-lane route to Rocker and Federal Aid Secondary Route 440, extending southwest of Butte. Interviews were not conducted at these two (2) locations.

Field interviewers were located at the other six (6) stations to determine the trip characteristics of as many vehicles as possible that passed through the station. Because of time required for interviewing and the resulting delay to motorists, only a portion of the vehicles were interviewed. However, an accurate record of all vehicles crossing the boundary during the period of interviewing was maintained so that the sample could be expanded to represent one hundred percent (100%).

Travel crossing the study boundaries can be categorized according to internal-external (and vice-versa) trips, through trips making a stop in the Butte urban area, and through trips that cross the urban area and do not stop. Traffic crossing the external boundary and having either an origin or a destination in the urban area numbered 9,574 trips or 8.6 percent of the total daily traffic. Through travel accounted for 4,417 trips or 3.9 percent of the total daily traffic. Of the through trips, 844, or 19.1 percent made a stop in the Butte urban area.

The external survey also showed that of these 844 trips with a stop in the study area, 7.1 percent, or sixty (60) stopped in the central business district.

SCREENLINE AND CORDON LINE COMPARISONS

To insure accuracy of the expanded travel survey data, manual classification traffic counts were conducted at six (6) of the surveyed external (or cordon line) stations and all seven (7) internal (or screenline) stations. The number of survey trips crossing these imaginary lines were compared with ground counts for a sixteen (16) hour period from 6 am to 10 pm.

Screenline comparisons were conducted for auto and taxi trips and for truck trips. These are illustrated in Figures III-1 and III-2. A third screenline comparison, shown in Figure III-3, combines autos, taxis, and trucks. It is noted that surveyed trips are consistently lower than ground counts, indicating a need for trip adjustments. These adjustments were made for each individual trip purpose.

A cordon line accuracy check was also performed. Internal-external trips were interviewed in both the internal survey and the external survey, making it possible to cross-check the two (2) surveys. Figure III-4 graphically illustrates this comparison.

The external survey was conducted in August when tourist travel is near its peak, while the internal survey was carried out in the late fall when tourist travel is low. To compensate for this seasonal variation, auto trips made by out-of-state vehicles were removed from the external survey. Results indicate a close comparison during the morning and afternoon peak travel periods with larger deviations during the off-peak hours. These can be attributed to seasonal variation of local traffic.

Table III-1 illustrates the number of adjusted trips from the 1970 origin-destination travel surveys. A total of 107,880 trips were made by area residents, resulting in an average of 7.88 trips per occupied household.

Table III-1

1970 ORIGIN - DESTINATION TRAVEL SURVEY TRIPS

Trip Purpose	Number of Adjusted Trips Between Zones	 Intra-Zonal	Total	%
Internal Survey				
Home Based Work	13,348	218	13,566	12.1
Home Based Other	51,160	1,829	52,989	47.2
Non-Home Based	24,298	804	25,102	22.3
Truck	4,511	462	4,973	4.4
Taxi	1,629	47	1,676	1.5
External Survey				
Internal - External	9,574	----	9,574	8.6
Subtotal (trips by study area residents)	104,520	3,360	107,880	96.1
External				
Through (with stops)	844	----	844	0.7
Through (without stops)	3,573	----	3,573	3.2
Total	108,937	3,360	112,297	100.0

1970 TRIP CHARACTERISTICS

Table III-2 is a comparison of trip generation characteristics from the 1965 Missoula, 1968 Great Falls, and the 1970 Butte Transportation Studies.

The following conclusions were derived from these comparisons:

* Butte has a high number of single person households resulting in an average of 2.88 persons per household which is substantially lower than Great Falls or Missoula. This fact is substantiated by the 1970 Census which shows an unusually high number of persons over sixty (60) years of age, 17.2 percent in Butte as compared to 11.2 and 10.9 percent in Great Falls and Missoula, respectively.

- Vehicle ownership in Butte is comparable to Great Falls which is also an industrial city. Missoula, a university town having a higher than average median income has a large number of multi-vehicle households.

- People in Butte average a slightly higher number of trips per day than residents of the other two (2) cities.

- The average occupied household in Butte generates 7.88 vehicle trips per day.

- Butte residents make an average of 6.02 trips per vehicle each day. This is about 23 percent higher than Missoula which is to be expected because of the higher vehicle ownership in Missoula.

In summary, the 1970 Butte travel characteristics as determined from the home interview survey are reasonably comparable to the other two (2) Montana transportation studies.

Table III-2

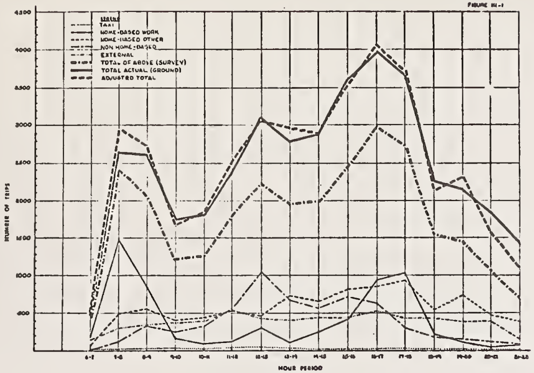
SUMMARY OF TRIP GENERATION CHARACTERISTICS

	1965 Missoula Study Area	1968 Great Falls Study Area	1970 Butte Study Area
Number of occupied households	14,610	23,354	13,680
Population	46,430	78,884	39,433
Number of vehicles owned*	25,767	30,501	17,905
Vehicle trips**	119,924	170,645	107,880
Persons per occupied household	3.18	3.38	2.88
Persons per vehicle	1.80	2.58	2.20
Vehicles per occupied household	1.76	1.31	1.31
Trips per person	2.58	2.16	2.74
Trips per occupied household	8.21	7.30	7.88
Trips per vehicle	4.65	5.60	6.02

* autos plus pickups ** trips by area residents only

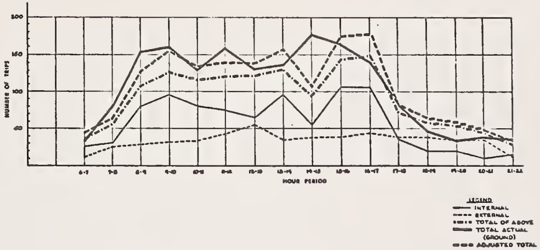
AUTO-TAXI SCREENLINE ACCURACY CHECK

FIGURE III-1



TRUCK SCREENLINE ACCURACY CHECK

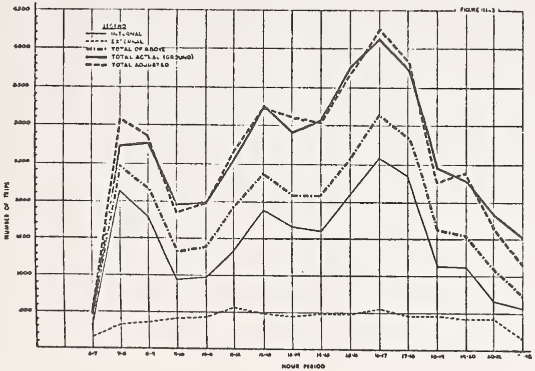
FIGURE III-2



1970 SCREENLINE AND CORDON LINE ACCURACY CHECKS (Figures III-1 - III-4)

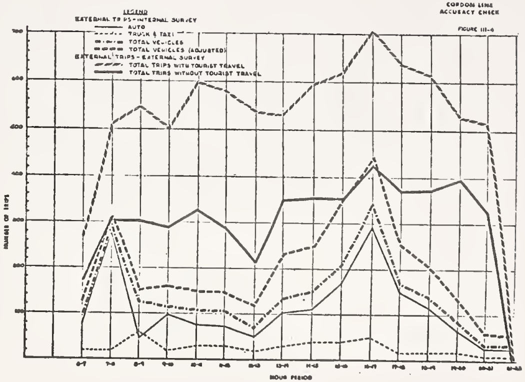
TOTAL VEHICLE SCREENLINE ACCURACY CHECK

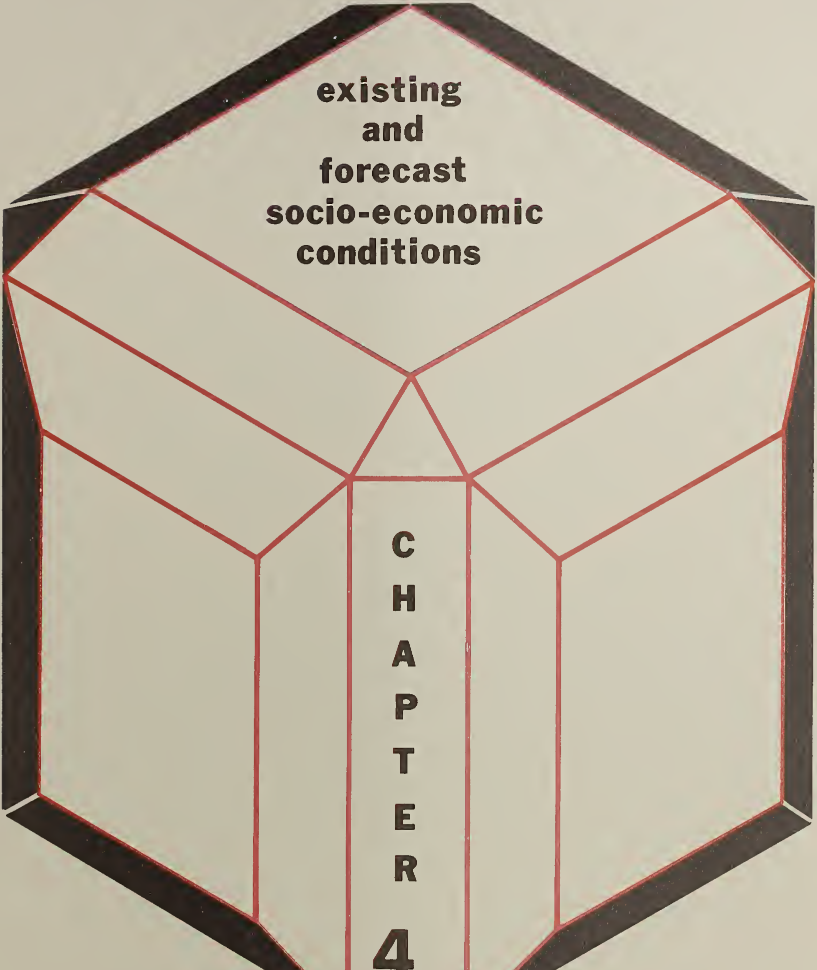
FIGURE III-3



CORDON LINE ACCURACY CHECK

FIGURE III-4





existing and forecast socio-economic conditions

CHAPTER 4

Chapter IV

EXISTING AND FORECAST SOCIO-ECONOMIC CONDITIONS

1970 SOCIO-ECONOMIC CONDITIONS

Inherent to the transportation planning process are the characteristics of population, households, employment, and other variables that have a positive correlation with the number of trips made in the study area. As these variables increase (or decrease) within a given district, the number of vehicles using the transportation system is expected to reflect a similar pattern of change. Since the travel surveys were conducted in 1970, socio-economic factors were determined for that same year. They are illustrated in Table IV-1.

Table IV-1

1970 SOCIO-ECONOMIC FACTORS

Population	39,433
Number of Persons Age 5 and Over	36,234
Employment	13,488
Households	
(Occupied and Vacant)	15,065
(Occupied)	13,680
Number of Cars and Pickups	17,905
Number of Trucks	888
Floor Space in Square Feet (excluding residential, resource and undeveloped).	10,098,638

The nature of these variables during 1970 will be investigated in the following paragraphs.

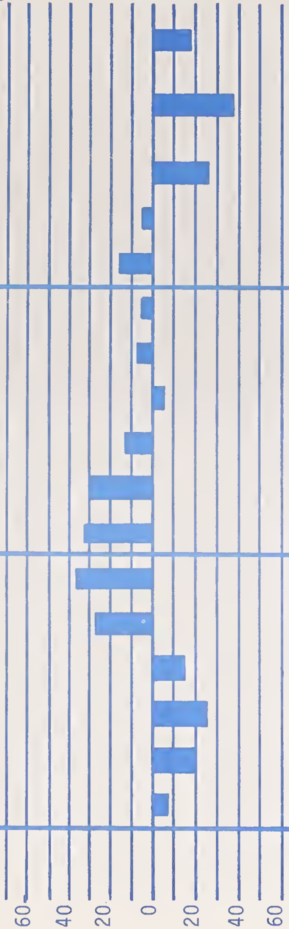
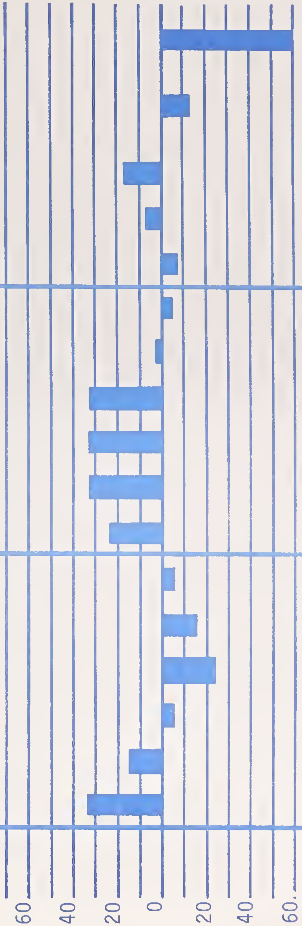
Population

Using U. S. Census Bureau data, population age-group trends between 1950-1960 and 1960-1970 were analyzed. These are graphically displayed in Table IV-2.

Population has dropped from 48,422 in 1950 to 41,981 in 1970. The decline is undoubtedly due to the economy's primary dependence upon one major industry - mining. This will be discussed in some detail under 1990 Forecasts.

Between 1950 and 1960, there was a substantial increase in age groups five (5) to nineteen (19) and during the following decade, the pattern was repeated. From 1960-1970 there was also an increase in the age twenty (20) to twenty-five (25) group. This indicates that a larger percentage of the younger people - those entering the labor force and in their most innovative and resourceful years, are remaining in the Butte area. The age group comparisons further reveal population decreases in the middle age groups. This has probably resulted from employee strikes and less mining employment opportunities. Senior citizen age groups - those persons over age sixty (60) have increased. Table IV-2 shows that this group has consistently gained in both number and percent of the total population, rising from 6,808 or 14.1 percent in 1950 to 7,219 or 17.2 percent in 1970. The travel surveys also reflect this large group of older persons. People in this age group make fewer trips than other groups. Over 40 percent of the sampled households reported no trips.

Table IV-2
Silver Bow County
AGE GROUP TRENDS, 1950-1970

Age	1950 Population		Percent Change 1950-1960	1960 Population		Percent Change 1960-1970	1970 Population	
85+	169	6,808 14.1%		201	7,177 15.4%		381	7,219 17.2%
80-84	1,056			475			607	
75-79				949			979	
70-74	1,269			1,579			1,274	
65-69	1,924			1,887			1,742	
60-64	2,390			2,086			2,236	
55-59	2,708	20,209 41.7%		2,626	17,275 37.2%		2,706	13,838 33.0%
50-54	2,863			2,698			2,695	
45-49	3,199			3,291			2,267	
40-44	3,665			3,247			2,225	
35-39	3,949			2,769			1,910	
30-34	3,825			2,644			2,035	
25-29	3,374	21,405 44.2%		2,136	22,002 47.4%		2,228	20,924 49.8%
20-24	2,857			2,050			2,399	
15-19	2,753			3,228			3,961	
10-14	3,484			4,374			4,553	
5-9	4,151			4,985			4,204	
0-4	4,786			5,229			3,579	
Total	48,422			46,454			41,981	

Potential dependent population can also be determined from the age group trends. Age groups forty-five (45) - fifty-four (54) and over forty-five (45) will be entering the dependency stages during the next twenty (20) years. Their numbers are shown in Table IV-3.

Table IV-3

POTENTIAL DEPENDENT POPULATION

Age Group	Population 1950	1960	1970
45-54	6,062	5,989	4,962
+45	15,578	15,792	14,887

Indication is that the senior citizen groups may expand slightly from 1970 to 1980, but subsequent to 1980, and without significant in-migration, should begin a gradual decline.

Distribution of 1970 population was found to vary geographically within the study area. Average household size in the central business district is 1.09 residents per occupied household. Areas outside the central business district and north of Front Street, have an average of 2.38 persons per unit. The newer residential areas south of Front Street show the largest average family size of 3.14 people per occupied household.

Number of Persons Age Five and Over

A child's interests outside the home begin to develop at about age five (5). From this age on into the teens, there is a need for transportation to school, neighborhood recreational areas and other social functions.

All of these trip purposes often cause parents to use the family automobile. As the child proceeds from grade school to high school, his life patterns develop and he takes on characteristics of an adult. The result is an increase in the number of trips to be made by either automobile or bus. For this reason, the number of persons age five (5) and over was found to correlate well with trips generated by a household.

The 1970 population data shows a study area population under age five (5) of 3,325.

Employment

The number of workers in a zone was found to have a direct correlation with the volume of traffic attracted to that zone. The type of employment of an area was also found to influence travel. A business engaged primarily in manufacturing or wholesale trade attracts mostly workers and truck traffic with few trips made by the general public. On the other hand, retail, service, cultural, and recreational establishments attract large volumes of short duration trips Employment for 1970 was geographically located and classified according to land use type. A summary of that inventory is shown in Table IV-4.

Table IV-4

1970 EMPLOYMENT BY LAND USE TYPE

Land Use Category	Zones C.B.D. 1-23	Zones 24-115	Total	Percent %
Residential	151	70	221	1.64
Manufacturing	132	335	467	3.46
Transportation, Communications, Utilities	525	167	692	5.13
Trade	951	1,747	2,698	20.00
Services	1,497	4,318	5,815	43.12
Cultural, Entertainment, and Recreation	54	34	88	0.65
Resource, Production and Extraction	60	3,401	3,461	25.66
Other	19	27	46	0.34
Total	3,389	10,099	13,888	----
Percent	25.13	74.87	----	100.00

This table shows that service related businesses employ 5,815 employees or 43.1 percent of the total employment. The second largest category includes all employees related to resource production and extraction and represents 25.6 percent of the study area's employment.

Silver Bow County's employment has continually declined during the past twenty (20) years, decreasing from 18,632 in 1950, to 15,399 in 1960, and to 14,543 in 1970. As stated under Population Characteristics, these decreases are no doubt due to decreasing mining employment opportunities and union strikes. During 1970, the Butte transportation study area accounted for 13,488 employees (92.7 percent). Since the labor force outside the study area is primarily engaged in agriculture and forestry, it is expected that most of the employment decrease occurred in the urban area.

Households

The number of households in a given area is one of the most important variables in estimating traffic volumes. In 1970 at least 66,555 trips, representing 59.3 percent of daily travel were home-based; i.e. either the trip origin or the trip destination was located at the motorist's home. The remaining trips amounted to 45,742, or 40.7 percent. A portion of these - some truck, taxi, and external trips are likely to have originated and/or ended at the traveler's home. An accurate account of the area's households is of utmost importance to the transportation study.

Households were geographically located according to whether they were single family or multi-family units. Of the 3,410 multi-family units in the study area, 3,098 or 90.8 percent are located north of Front Street. Furthermore, 1,794 or 52.6 percent are either within or immediately adjacent to the central business district. Nearly the opposite is true for single family residences. Approximately ten percent are located in and around the central business district, 5,042 or 43.3 percent lie north of Front Street, and the remaining 6.613 or 56.7 percent are situated on the "flats" south of Front Street.

Vehicles

The number of cars and pickups per household was found to vary with the location in the metropolitan area. Four homogeneous areas were identified; average ratios ranged from 0.33 to 1.547. Table IV-5 describes these areas and the corresponding ratio of vehicles per household.

Table IV-5

1970 VEHICLES PER HOUSEHOLD

Area	Location	Vehicles per Household
1	Central Business District	0.33
2	West of Excelsior Avenue	1.33
3	North of Front Street and exclusive of areas 1 and 2	1.025
4	South of Front Street	1.547

The average for the entire study area was found to be 1.31 vehicles per household.

There were 888 trucks operating in the transportation study area during 1970. This represents approximately 3.9 percent of the total vehicles registered; truck use was associated with commercial uses, general industry, construction, mining and other city and state maintenance operations.

Floor Space

Inventories conducted during the development of the Butte - Silver Bow County Comprehensive Plan included a detailed study of existing floor space. An Existing Land Use Map was prepared to graphically illustrate the location of floor space. That map is shown on page IV-10.

There were approximately twelve million square feet of floor space in the study area in 1970. About 1.9 million were attributable to residential uses, resource production and extraction, and vacant space. The remaining 10.1 million square feet included manufacturing, transportation, communication, utilities, commercial and cultural-recreational land uses. This latter group was distributed as follows: 2.25 million in the central business district, 3.91 million north of Front Street and outside the central business district, and 3.94 million south of Front Street. Sixty (60) percent of the floor space located in the south flats area is clustered along Harrison Avenue.

Multiple regression analyses indicated that floor space correlated well with the number of trips made in the study area.

Existing Land Use Patterns

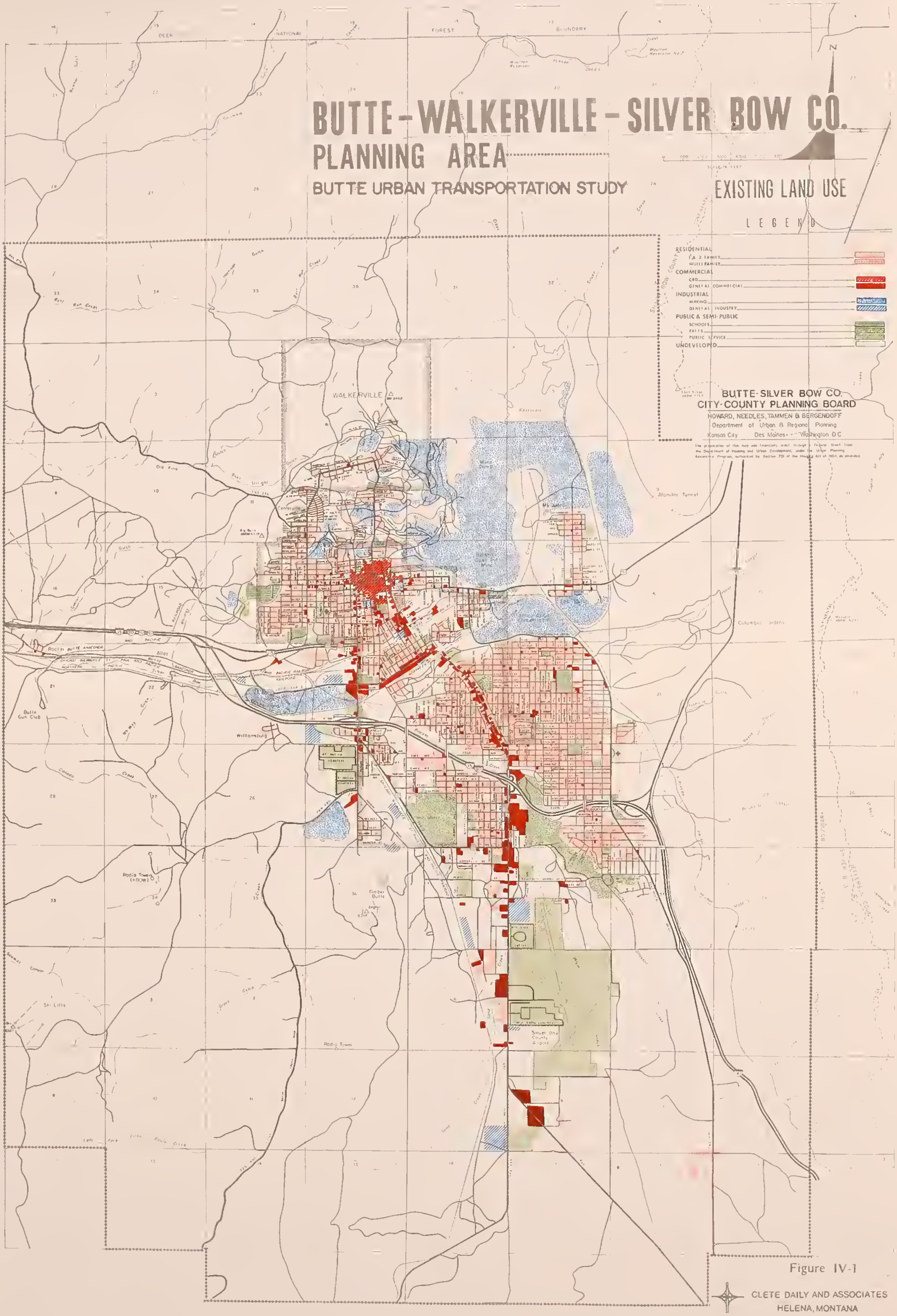
Reference is made to Figure IV-1 which has been reproduced from the Butte - Silver Bow County Comprehensive Plan. For a detailed description of land use patterns portrayed refer to the Comprehensive Plan.

The Existing Land Use Map was used in this transportation study to forecast future land use distributions. The map, along with a 1972, one thousand scale aerial photograph helped to identify existing patterns of growth, land use, and vacant land.

1990 FORECASTS

Population, Employment, Households

Silver Bow County has historically been dependent upon the mining operations as an economy base. This dependency has caused severe fluctuations of the area's economy. As mining activity fluctuated, corresponding changes occurred in the county's population and employment. The vacancy rate of households was affected more directly than the actual number of available units. Employee strikes against the major employer have also been common, resulting in periodic in/out migrations



BUTTE-WALKERVILLE-SILVER BOW CO.
PLANNING AREA
BUTTE URBAN TRANSPORTATION STUDY

EXISTING LAND USE

LEGEND

RESIDENTIAL
1 & 2 FAMILY
MULTI FAMILY
COMMERCIAL
CBD
GENERAL COMMERCIAL
INDUSTRIAL
MINING
GENERAL INDUSTRY
PUBLIC & SEMI-PUBLIC
SCHOOLS
PARKS
PUBLIC SERVICE
UNDEVELOPED

BUTTE-SILVER BOW CO.
CITY-COUNTY PLANNING BOARD
HOWARD, NEEDLES, TAMMEN & BERGENDOFF
Department of Urban & Regional Planning
Kansas City Des Moines Washington D.C.

The preparation of this map was financially aided through a Federal Grant from the Department of Housing and Urban Development, under the Urban Planning Assistance Program, authorized by Section 701 of the Housing Act of 1954, as amended.

Figure IV-1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

of workers and their families. Supporting industries and commercial activities were also affected by fluctuations in mining activity. These conditions, coupled with the increased use of improved mining technology, have caused a declining population trend over the past twenty (20) years.

Dependency upon mining is diminishing. In 1950, 6,006 employees, or 32.2 percent of Silver Bow County's employees were directly engaged in mining. By 1960, the number had decreased by nearly half to 3,294, or 21.4 percent. Between 1960 and 1970, there was a further decrease to 2,970 employees, or 20.4 percent.* By 1990, mining is expected to employee 2,250 workers and represent only 13.4 percent of the labor force. These diminishing percentages indicate that industrial, manufacturing, and commercial employment is gaining a greater share of the county's labor force. This is expected to add stability to the area's economy and give workers more freedom and opportunity in their choice of employment. The labor market will be more attractive to young people and lend greater security to middle-age and older personnel.

Butte - Silver Bow County is predicted to grow in size and density throughout the transportation planning period, 1970-1990.. Projected socio-economic data is shown in Table IV-6. Population and the number of households are forecasted to increase by about seventeen (17) percent, while employment will increase by twenty-two (22) percent. The latter is five percent higher because of a trend of increasing numbers of women seeking employment.

---

* United States Bureau of Census.

Table IV-6

FORECASTED INCREASE IN SOCIO-ECONOMIC CHARACTERISTICS, 1970-1990

	1970	1990	Increase Number	Increase Percent (%)
Population	39,433	46,133	+ 6,700	+ 17.0
Number of Persons Five and Over	36,234	42,928	+ 6,694	+ 18.4
Employment	13,488	16,500	+ 3,012	+ 22.3
Dwelling Units (Occupied & Vacant)	15,065	17,712	+ 2,647	+ 17.5
(Occupied)	13,680	15,930	+ 2,250	+ 16.4
Number of Cars & Pickups	17,905	22,000	+ 4,095	+ 22.8
Number Trucks	888	1,804	+ 916	+103.1
Floor Space in Square Feet*	10,098,638	16,541,921	+6,443,283	+ 63.8

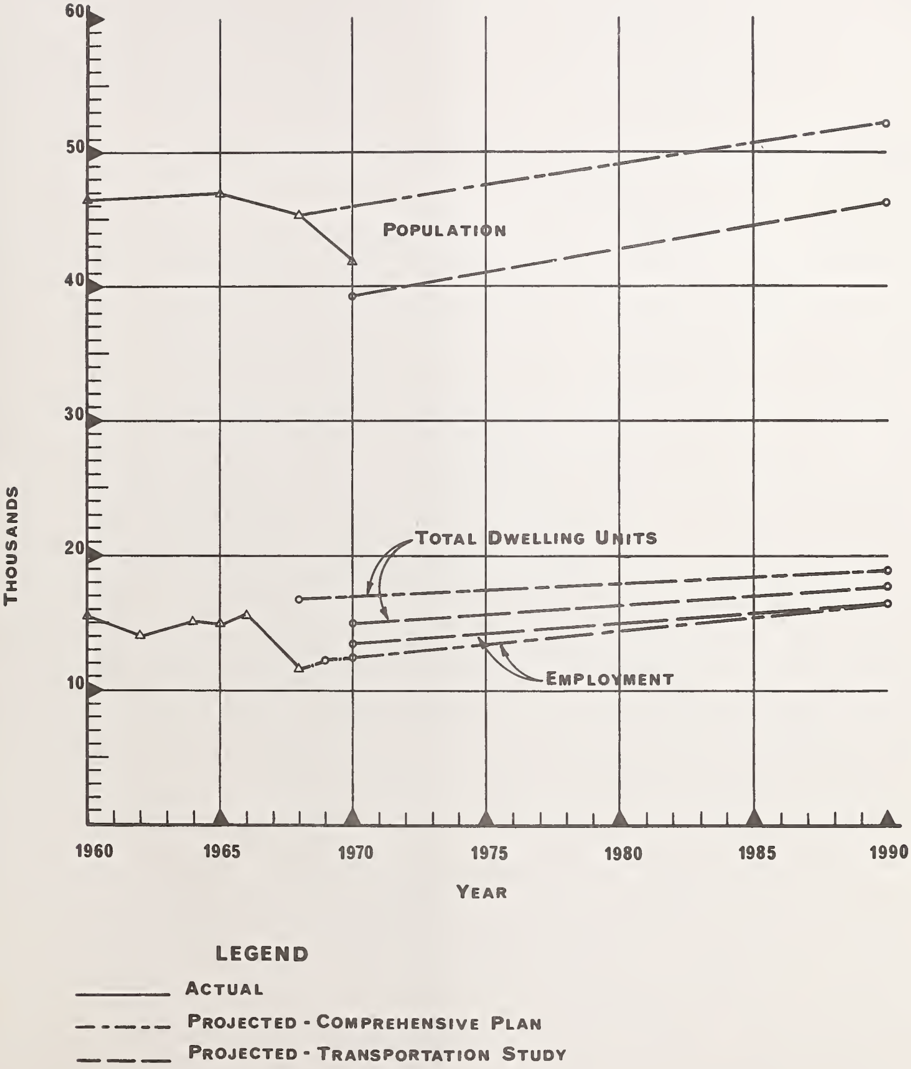
* Excluding Residential, Resource, and Undeveloped Land.

The table shows that the number of persons five (5) years and over will increase from 36,108 in 1970 to 42,928 in 1990. Throughout this twenty (20) year planning period, the under age five (5) categories will enlarge in number but decrease from 8.4 percent to 6.9 percent of the total population. This is due to a trend toward smaller family size, and the result will be a greater percentage of the population contributing to generation of the area's travel.

Figure IV-2 graphically portrays these projected increases for population, households, and employees and compares them with the forecasts as set forth in the Butte - Silver Bow County Comprehensive Plan. In each case, the lines are nearly parallel; increases forecast in the Comprehensive Plan were adopted for the transportation study. However, the former projections were made in 1969, prior to the 1970 U. S. Census.

FIGURE IV-2

FORECASTS OF POPULATION, EMPLOYMENT, AND DWELLING UNITS



Initial values were adjusted to compare with the Census, after which the original projections were applied. The necessary adjustments are fully described in Tech Plan Report Number 3, published in June, 1973.

Employment was studied in considerable detail during development of the Comprehensive Plan. Forecasts by major industrial classification were adopted from that Plan. They are given in Table IV-7. The mining industry will still employ a significant percentage (13.4%) of the labor force; however, it is surpassed by three (3) other land use categories - manufacturing, trade and services. These forecasts reflect the trend toward employment diversification.

Table IV-7

EMPLOYMENT FORECAST BY MAJOR INDUSTRY

	1990
Agriculture, Forestry, Fisheries	100
Mining	2,250
Construction	900
Manufacturing	2,300
Transportation, Communication, Utilities	1,450
Trade	3,900
Services	3,600
Finance, Insurance, Real Estate	700
Public Administration	900
Other	400
Total	16,500

Source: Butte - Silver Bow Comprehensive Plan; Population and Economic Inventory and Analysis; p. 18-7.

Vehicles

Travel surveys conducted in 1970 revealed that the ratio of vehicles per household varies according to the geographic location within the study area. The general areas are described above under 1970 Socio-Economic Characteristics. It is predicted that by 1990 there will be an additional 4,095 cars and pickups operating on the Butte urban area's roadways. This represents an increase of 22.8 percent. Since each vehicle is expected to average 6.93 trips per day in 1990, these vehicles will contribute nearly 28,400 trips to the street system.

Floor Space

The Transportation Policy Committee elected to base the Transportation Plan on the 1990 Land Use Plan shown in Figure IV-3. The adopted Land Use Plan was revised slightly (to Figure IV-3) to show the central business district in its present location with a slight increase in the intensity of use. In addition, Figure IV-3 contains a few existing but non-conforming land uses so that traffic assignments would be realistic as possible. Occupied floor area in the central business district totaled 2,251,234 square feet in 1970. There will be no significant change in the amount of floor area by 1990; however, the distribution is expected to reflect a general shift to the west near Montana Street. This trend is beginning to take place with the new city office complex planned for zone 21, bordered by Galena, Mercury, Montana and Idaho Streets. Existing city administration is located along Broadway Street between Main and Wyoming Streets.

There will be floor space expansion during the planning period. In fact, 6,380,900 square feet of occupied floor space is expected to be added to the urban area. Distribution of this floor space has been in accordance with the 1990 Land Use Plan, illustrated in Figure IV-3.

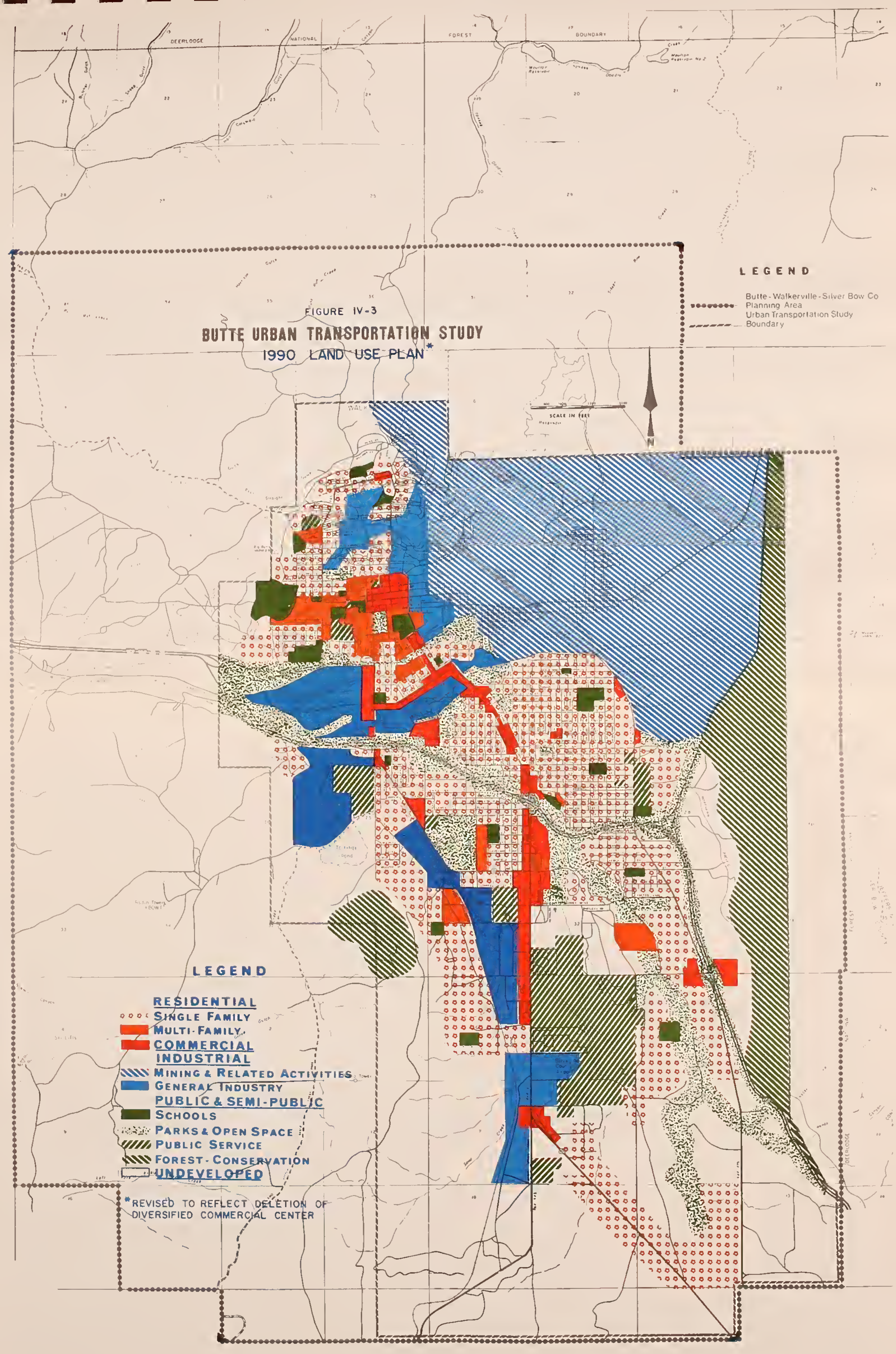


FIGURE IV-3

BUTTE URBAN TRANSPORTATION STUDY

1990 LAND USE PLAN*

*REVISED TO REFLECT DELETION OF DIVERSIFIED COMMERCIAL CENTER

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

1990 Land Use Distributions

Socio-economic variables for 1990 were distributed to 115 traffic analysis zones in accordance with the land use plan illustrated in Figure IV-3. The zones were grouped into the same five (5) area sectors as used for the Butte - Silver Bow Comprehensive Plan. The sectors are shown in Figure IV-4.

Population, employment and the number of households are compared by sector for 1970 and 1990 in Table IV-8.

Table IV-8

SECTOR COMPARISON OF 1970
AND 1990 POPULATION, HOUSEHOLDS, EMPLOYMENT

	Population			Households (Occupied Plus Vacant)			Employment		
Sector	1970	1990	Change	1970	1990	Change	1970	1990	Change
1	17,602	17,399	- 203	8,051	6,712	-1,339	10,347	9,101	-1,246
2	1,124	1,590	+ 466	531	1,085	+ 554	392	3,080	+2,688
3	20,535	26,527	+5,992	6,440	9,346	+2,906	2,668	4,069	+1,401
4	172	617	+ 445	43	172	+ 129	81	227	+ 146
5	0	0	0	0	0	0	0	23	+ 23
Total	39,433	46,133	+6,700	15,065	17,315	+2,250	13,488	16,500	+3,012

All three variables show decreases in sector one and corresponding increases in the remaining sectors, thus reflecting a shift from the northern portions of the study area to the newer developing areas south of the central business district. Population, however, does not decrease as much as households and employment. This is due to the existing high vacancy rate and the older population with small families.

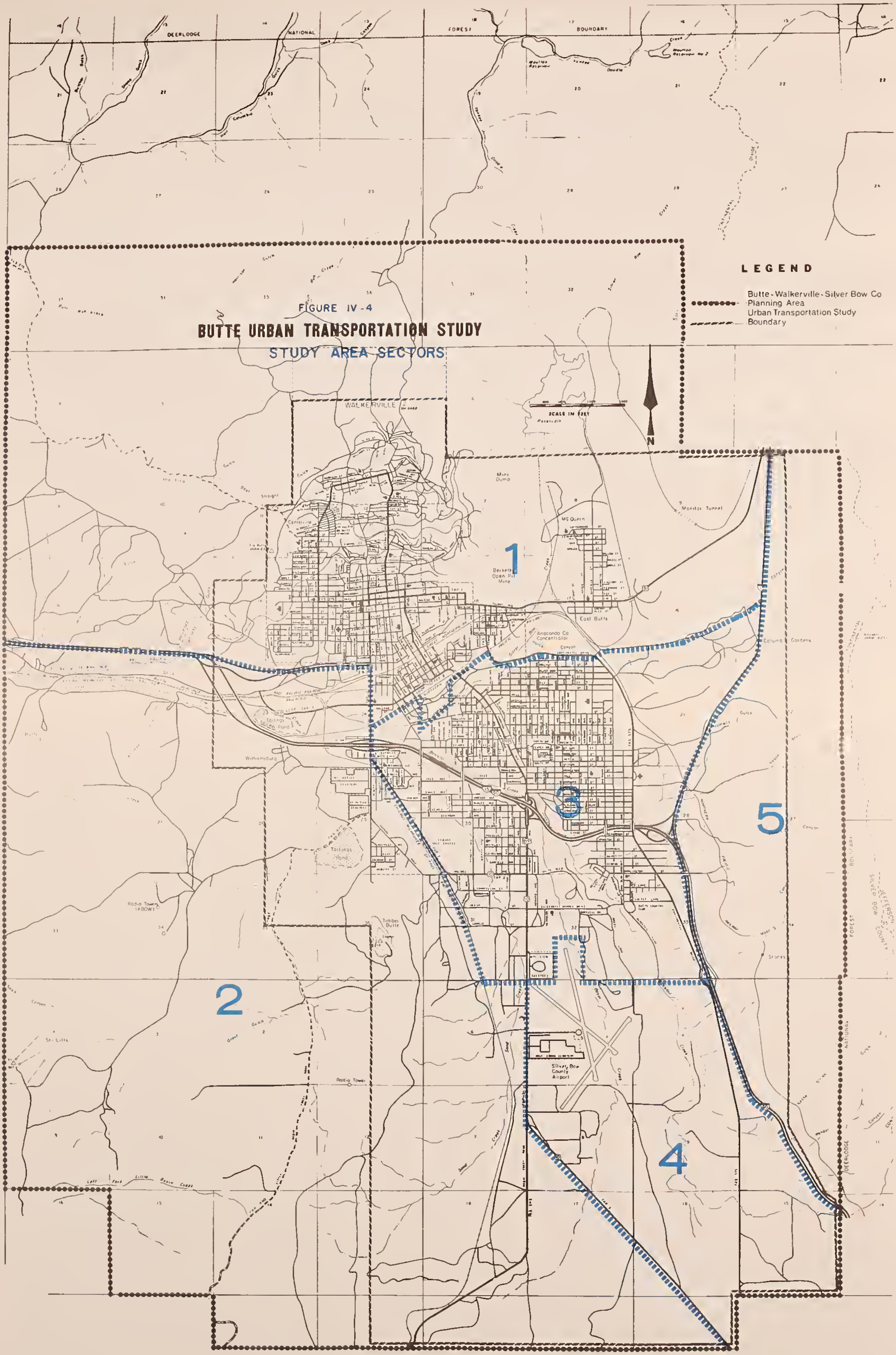


FIGURE IV-4

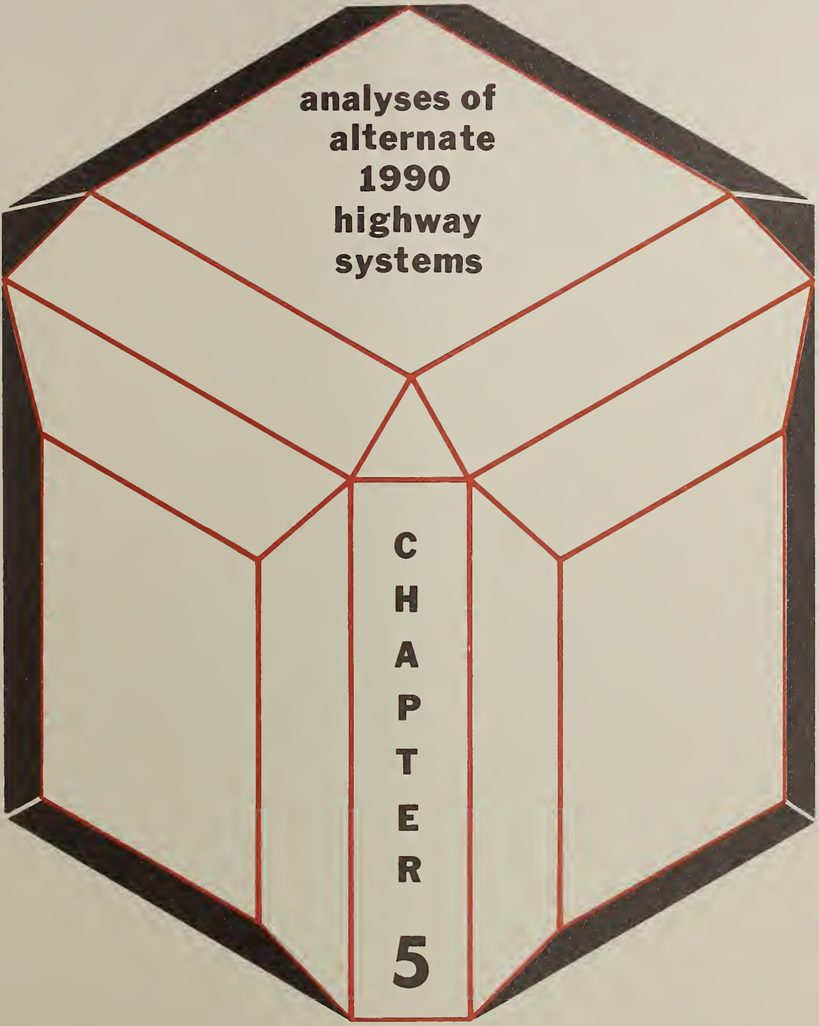
BUTTE URBAN TRANSPORTATION STUDY

STUDY AREA SECTORS

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

The largest increases for both population and households are expected to occur in sector three (3). This is the heart of the urban area. A substantial increase in employment is also forecast (+1,401 employees); this is exceeded by sector two (2) which contains the Port of Butte warehouse facilities.

Socio-economic characteristics have been studied in detail for 1970, and forecast and distributed for 1990. Using these variables on a zonal level, future trip productions and attractions were forecast for the target year, 1990. The trips have been distributed and assigned to three different test highway networks in order to arrive at the system best suited to handle future travel. Analyses of these three systems will be discussed in the next chapter.



analyses of alternate 1990 highway systems

CHAPTER 5

Chapter V

ANALYSES OF ALTERNATE 1990 HIGHWAY SYSTEMS

Forecast socio-economic factors were distributed to the 115 traffic analysis zones in accordance with the 1990 Land Use Plan. Using the trip generation equations developed for the base year (1970), future travel was predicted. It was distributed and assigned to the existing plus committed highway system and to three alternate future systems. Steps employed in testing these four highway networks are illustrated in Figure A-1 in the Appendix.

1990 TRAFFIC ASSIGNMENT TO EXISTING PLUS COMMITTED SYSTEM

Future travel assigned to the existing plus committed system was compared with 1972 average daily traffic. That comparison is displayed in Figure V-1. Observation readily reveals which routes show increases or decreases.

Deficiencies

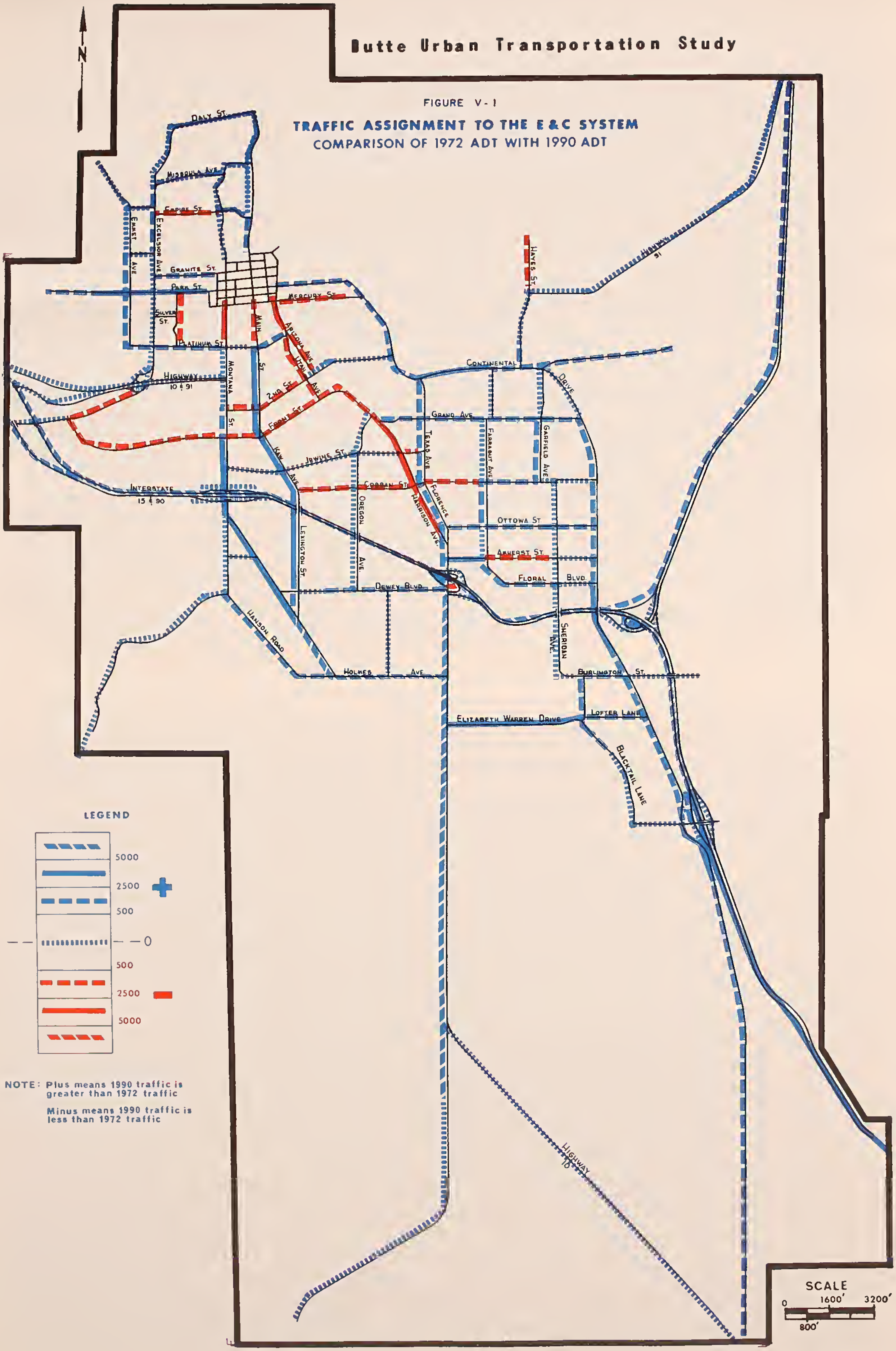
The purpose of analyzing future travel on the existing plus committed system was to determine the location of deficiencies that will occur if improvements are not made to the present street system. Deficiencies were identified by comparing service volumes with demand volumes. A measure of a street or highway to accomodate traffic is the service volume. It is defined as the maximum number of vehicles

Butte Urban Transportation Study

FIGURE V-1

TRAFFIC ASSIGNMENT TO THE E & C SYSTEM

COMPARISON OF 1972 ADT WITH 1990 ADT



NOTE: Plus means 1990 traffic is greater than 1972 traffic

Minus means 1990 traffic is less than 1972 traffic

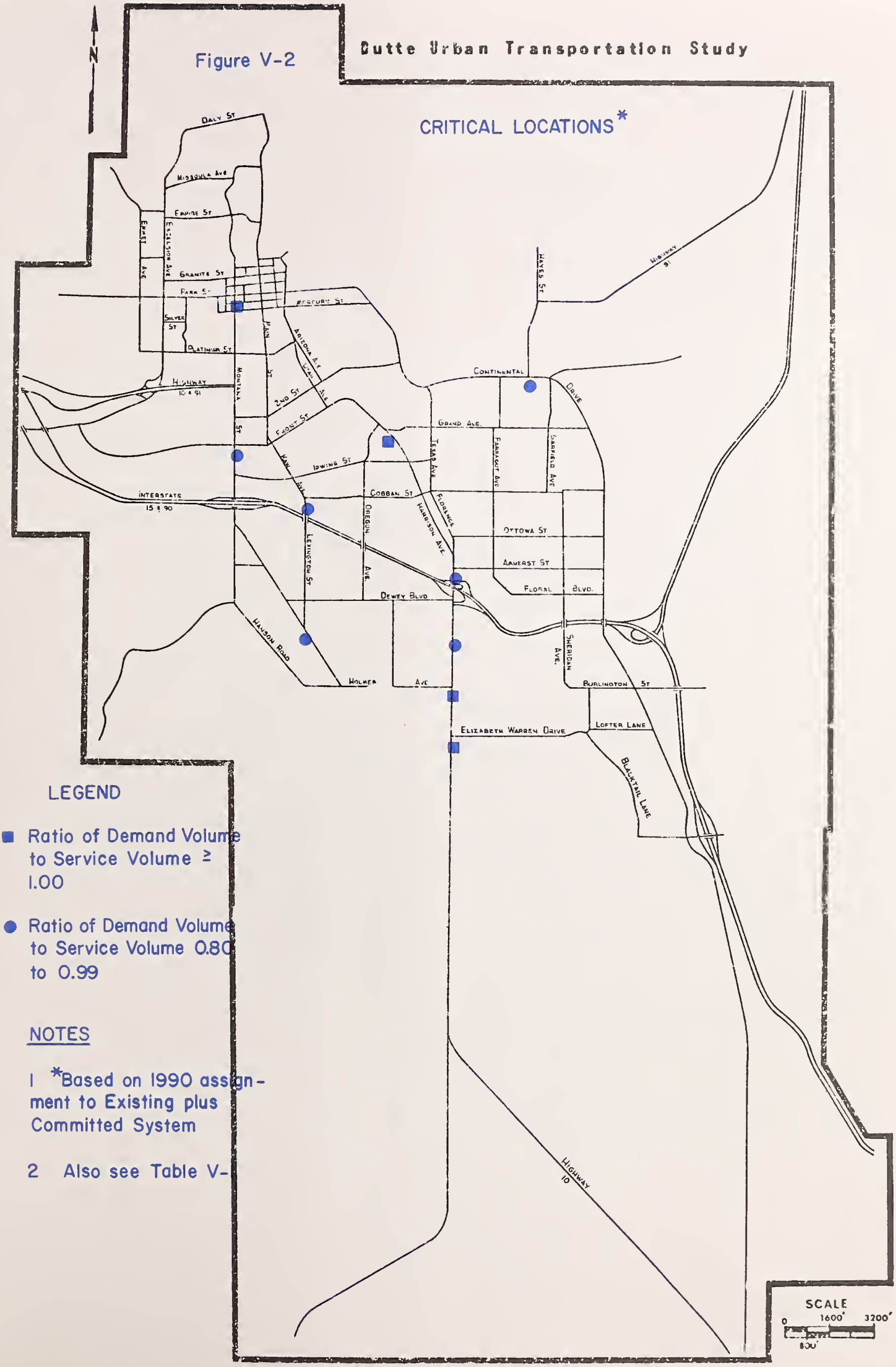
CLETE DAILY AND ASSOCIATES
Helena, Montana

that can pass over a given section of roadway during a specified time while selected operating conditions prevail on the section under study. Service volumes vary according to the Level of Service chosen. Level "C" was adopted as it corresponds to recommended design volumes. Demand volumes were obtained from the assignment of 1990 trips to the existing plus committed network. Ratios of demand volume to service volumes (DV/SV) were analyzed for the entire roadway system, including extended roadway lengths, intersections, and freeway ramps.

When ratios of demand volumes to service volumes exceed 1.00, the highway section's demand volume is higher than the specified service volume and Level of Service C is no longer possible; it may drop to Level D, E or F. The lowest level, F, indicates bumper-to-bumper forced flow. If demand volume to service volume lies between 0.80 and 0.99, the highway link in question is approaching critical operation and should be examined for required upgrading.

Three (3) locations were found to have demand volume to service volume ratios of greater than 1.00, while seven (7) others fell between 0.80 and 0.99. They are listed in Table V-1 and illustrated in Figure V-2.

Figure V-2



CRITICAL LOCATIONS*

LEGEND

■ Ratio of Demand Volume to Service Volume ≥ 1.00

● Ratio of Demand Volume to Service Volume 0.80 to 0.99

NOTES

1 *Based on 1990 assignment to Existing plus Committed System

2 Also see Table V-

CLETE DAILY AND ASSOCIATES
Helena Montana

Table V-1

EXISTING PLUS COMMITTED SYSTEM

CRITICAL LOCATIONS

1990 TRAVEL

Location	Direction	DV/SV*
Montana and Park Streets	East Bound	1.18
Harrison Avenue and Holmes Avenue	East Bound	1.77
Harrison Avenue and Elizabeth Warren Drive	West Bound	1.09
Harrison Avenue and Roosevelt Avenue	South Bound	0.90
Harrison Avenue and Amherst Street	North Bound	0.87
Holmes Avenue and Lexington Street	Northwest Bound	0.81
Montana Street and Front Street	North Bound	0.95
Kaw Avenue and Cobban Street	South Bound	0.88
Harrison Avenue and Grand Avenue	West Bound	1.07
Continental Drive and Concentrator Road	East Bound	0.88

* DV/SV = Ratio of Demand Volume to Service Volume at Level of Service C

Forecasted 1990 traffic on the existing system shows deficiencies along Harrison Avenue from Holmes Avenue to Mountain View Cemetery. Demand volume to service volume ratios ranged between 1.86 near Holmes Avenue to 1.16 immediately north of the cemetery. These critical conditions will be relieved by the committed project, calling for widening from two (2) to four (4) lanes and scheduled for July, 1976.

Conclusions

Four (4) network sections were chosen for an indepth examination of the origins and destinations of all trips crossing a selected link. Two are located along Harrison Avenue - one near the Burlington Northern Railroad overpass and the second immediately north of the Plaza Shopping Center. A third link is located on Montana Street just north of IR15-90, and the fourth is on Park Street just east of Excelsior Street. Results of the select link loadings were examined to determine the origin and destination of traffic on the critical sections listed above. This analysis revealed the following pertinent facts:

- Improvements along Harrison Avenue between Front Street and IR15-90 should be tested as part of a future system.
- Residential and commercial growth is expanding south of the interstate. An alternate north-south corridor to the west of Harrison Avenue should be examined.
- Industry is expanding south of IR15-90. Designated truck routes are needed to help remove heavy truck traffic from arterial streets.
- Elizabeth Warren Drive serves as the only connection between Harrison Avenue and Continental Drive south of IR15-90. Alignment is poor and future expansion of airport runway 15-33 may require relocation or closing. An alternate route should be tested.
- A designated east-west route in the vicinity of the Civic Center should be tested.
- Improvements to Park Street between Excelsior Avenue and Montana Street should be tested.
- The Main Street - Kaw Avenue corridor indicates traffic increases. Improvements should be tested.

The initial future street and highway system loaded with 1990 traffic, was the system developed as part of the 1971 Comprehensive

Plan. This system was designed to serve a land use plan which called for the development of a diversified commercial center located along Harrison Avenue west of the airport.

The system was tested by loading projected 1990 traffic. Results indicated that all major improvements were located south of IR15-90. These loadings were reviewed by the Policy Committee and it was decided that the relocation of the central business district was not a valid assumption until positive action was taken which would indicate that the relocation would take place. Also, at this time, several alternate sites were being discussed as part of a central business district study being conducted by the City-County Planning Board. It was the Policy Committee's decision to proceed with the transportation study, using an adjusted land use plan which recognized continuing strip development along Harrison Avenue with the existing central business district remaining at nearly the existing level of activity.

Following this decision three (3) alternate future systems were tested using computer simulation of 1990 travel.

ALTERNATE SYSTEM ONE (1)

Choosing the System

The first alternate test system was based on the Butte - Silver Bow County Thoroughfare Plan. That plan was developed to serve the 1990 Land Use Plan which included the proposed Diversified Commercial Center located along Harrison Avenue west of the airport. The land use plan was revised by deleting the Diversified Commercial Center and showing only moderate strip commercial development, causing some of the proposed routes south of the interstate not to load heavily.

The Thoroughfare Plan called for a number of additions to the existing plus committed highway system. They are as follows:

- A beltway extending southward from Montana Street, swinging to the east of Timber Butte and connecting Harrison Avenue at the intersection of Basin Creek Road. The beltway continues eastward and terminates at Continental Drive.

- Western Boulevard extends southward about one (1) mile from Holmes Avenue. The Thoroughfare Plan calls for its extension southward to connect with the beltway described above.

- An east-west cross-town connector route extending westward from the IR-90 diamond interchange at Blacktail Lane to the proposed beltway on the west. The Thoroughfare Plan recommended that routing either due west, tunneling under the airport or on an alignment just to the north of the airport. The northern route was considered the most feasible and was included in the first test system.

- A partial diamond interchange with IR-15 near Columbia Gardens was included. It connected to Continental Drive at Grand Avenue.

- Improvements to Harrison Avenue north of the interstate, and Park Avenue west of Montana Street are contemplated. Slight increases in travel speed to reflect the physical and operational improvements were included.

The only other alterations to the existing plus committed system included minor speed changes to correspond to growth and increased congestion in some areas south of IR15-90, and the elimination of Highway 91 entering Butte from the northeast.

Coding the System

Alternate system one (1) is illustrated in Figure A-4 in the Appendix. Additions were coded with node numbers ranging between 800 and 899.

Considerable effort was expended to insure that travel speeds for this and subsequent systems were realistic.

West Belt Drive is intended as a fairly high speed connection from Montana Street to the flats area of Butte, west of the airport. It would serve in much the same capacity as Continental Drive, which had base year speeds ranging between 31 and 35 miles per hour. The speed coded for West Belt Drive on test system #1 was 35 miles per hour.

The new route connecting Harrison Avenue with Continental Drive south of the airport is an extension of the West Belt Drive and was also coded 35 miles per hour.

Western Boulevard is proposed as a minor arterial and was coded with an operating speed of 28 miles per hour.

Elizabeth Warren Drive - Lofter Lane is the only existing connector between Harrison Avenue and Continental Drive south of the interstate. Elizabeth Warren Drive and Lofter Lane had 1970 speeds of 23 and 29 miles per hour, respectively. Lowell Street - Four Mile Vue

Road is intended to provide an east-west connector between West Belt Drive, Harrison Avenue and Continental Drive. This route was coded with speeds of 28-30 miles per hour.

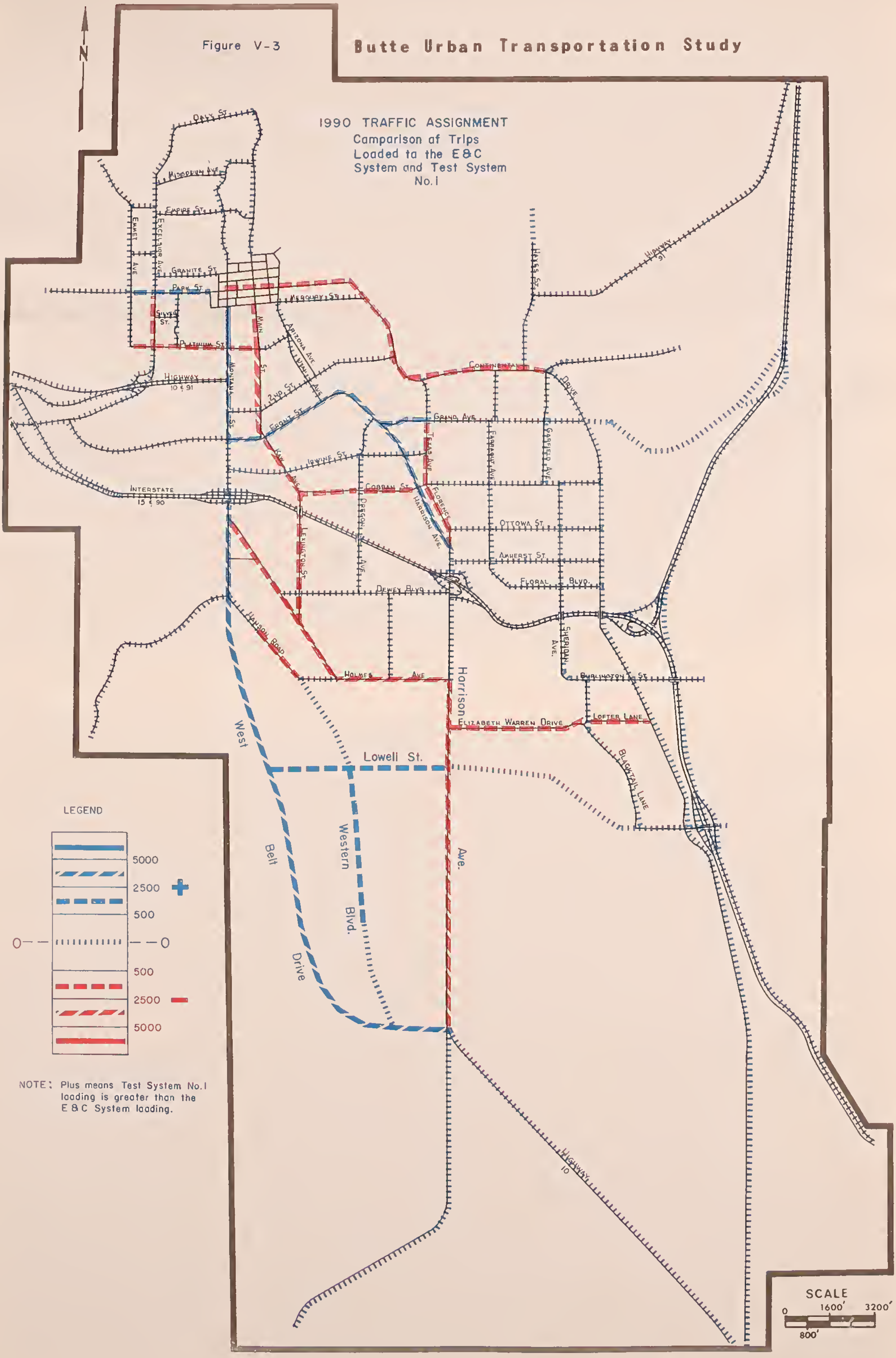
The Columbia Gardens interchange and connector route will require curvature and rather steep grades. Coded speeds ranged from forty (40) miles per hour near the interstate exit and entrance to twenty (20) miles per hour near Continental Drive. Average coded speed was thirty (30) miles per hour.

Other speed changes include the following: South Harrison Avenue, having speeds of 44 miles per hour in 1970 was reduced to 31 miles per hour to reflect increased commercial expansion and congestion. Harrison Avenue, from Utah Avenue to Cobban Street was increased by two (2) miles per hour to reflect planned improvements. Continental Drive from Blacktail Lane south was reduced from 44 miles per hour to 32 miles per hour, reflecting increased residential development. Holmes Avenue was decreased in speed from forty (40) to 33 miles per hour between Wynne Street and Dewey Boulevard to reflect increased development. Speeds along South Montana Street, between Holmes Avenue and Hansen Road were increased from 24 to 30 miles per hour because of its connection with West Belt Drive and subsequent improvements anticipated with the connection.

The 1990 trips were distributed and assigned to test system number one (1). Assigned volumes were compared with the 1990 volumes as loaded onto the existing plus committed system. Comparisons are illustrated in Figure V-3.

Figure V-3

Butte Urban Transportation Study



1990 TRAFFIC ASSIGNMENT
Comparison of Trips
Loaded to the E&C
System and Test System
No. 1

NOTE: Plus means Test System No. 1 loading is greater than the E & C System loading.

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Results

The most significant results are noted below:

- Harrison Avenue, between Front Street and IR15-90, showed traffic increases of up to 5,300 vehicles per day indicating minor upgrading would be justified.
- Traffic on Harrison Avenue immediately south of IR15-90 increased by 200 vehicles per day.
- Harrison Avenue south of Holmes Avenue showed decreases of 4,110 vehicles per day.
- Traffic on Park Street increased by 450 vehicles per day.
- Many of the new routes south of IR15-90 were assigned very little traffic. This was expected because the Diversified Commercial Center was removed from the Land Use Plan.
- The Columbia Gardens connector loaded with 375 vehicles per day.

ALTERNATE SYSTEM TWO (2)

Choosing the System

The first future test system was altered to form the second system. Alterations are given below:

- West Belt Drive was deleted, and a western beltway was added by connecting Hansen Road with Western Boulevard, extending southward to the intersection of Harrison Avenue and Basin Creek Road.

* Lowell Street (near Montana Department of Highways) was added to the system and extended eastward from Harrison Avenue to Blacktail Lane. This provided an east-west connection just north of the airport.

* Elizabeth Warren Drive was removed from the network system and designated as a local route.

* An east-west route, connecting Harrison Avenue with Continental Drive and located immediately south of IR15-90, was added by extending Hannibal Street westward from Sheridan Street to Harrison Avenue.

* The Columbia Gardens interchange and connector was retained on the system.

Coding the System

Alternate system two (2) used node numbers 900 to 999 to code additions and changes from the existing plus committed system. The network is illustrated in Figure A-5 in the Appendix.

Travel speeds were determined in the same manner as for the first test system. Western Beltway was coded at 35 miles per hour; Lowell Street connection - 25 miles per hour; and Hannibal Street - 20 miles per hour. Travel speeds on Harrison Avenue and Park Street were increased by approximately 2 miles per hour.

Results

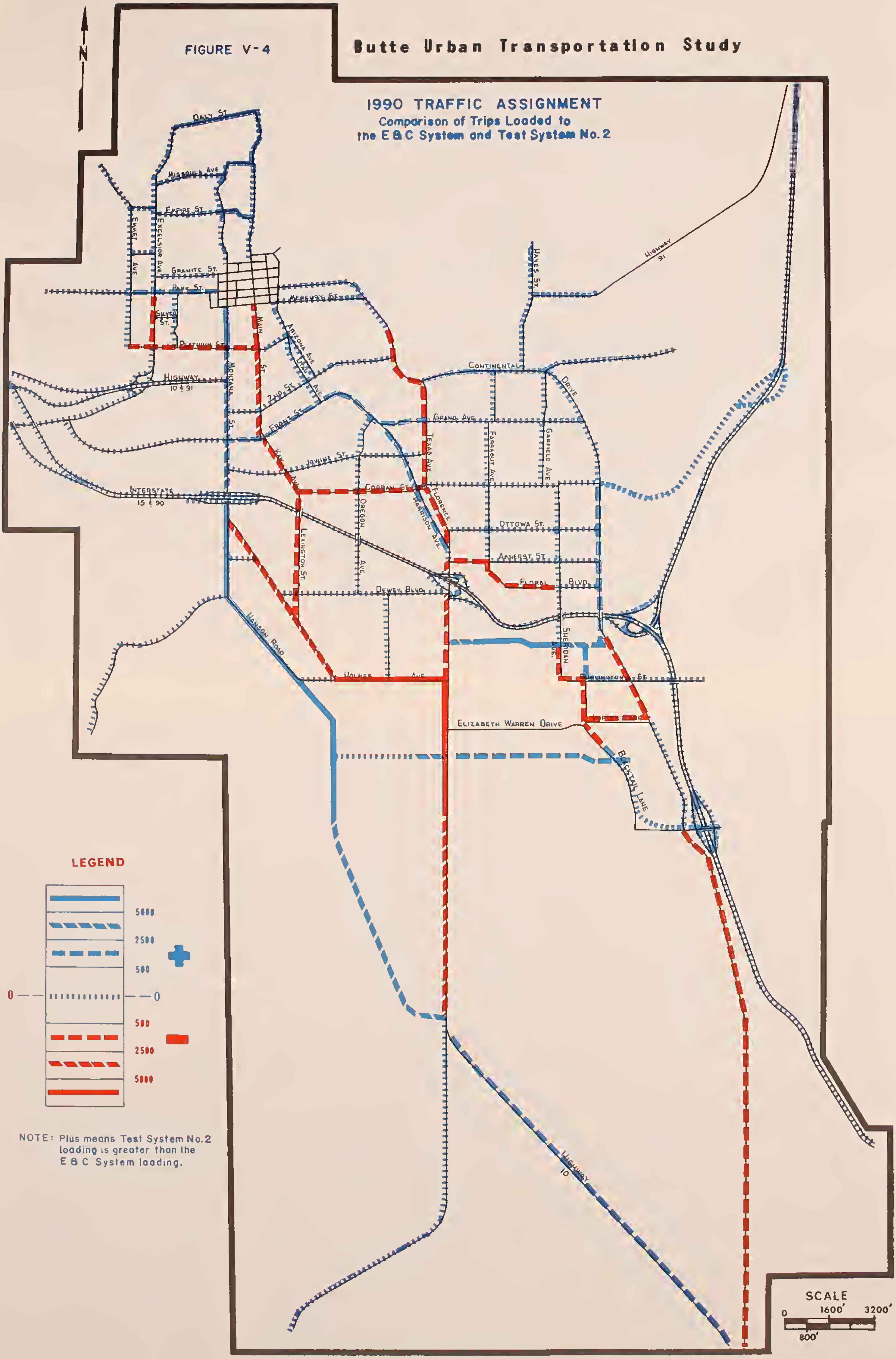
Figure V-4 compares 1990 volumes assigned to the existing plus committed system with 1990 volumes assigned to test system two (2).

FIGURE V-4

Butte Urban Transportation Study

1990 TRAFFIC ASSIGNMENT

Comparison of Trips Loaded to the E & C System and Test System No. 2



NOTE: Plus means Test System No. 2 loading is greater than the E & C System loading.

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Significant results are summarized below:

- Western Beltway loaded with up to 6,000 vehicles per day, indicating that it has the potential to serve the future Land Use Plan quite well.
- Lowell Street was assigned 1,800 vehicles per day. This route serves as a collector street.
- The extension of Hannibal Street loaded with 6,000 vehicles per day, showing it to be a feasible location for an east-west connector south of IR15-90.
- Harrison Avenue in the vicinity of the IR15-90 interchange was relieved as traffic volumes decreased by 2,600 vehicles per day. This is due to the Hannibal Street extension.
- The Columbia Gardens connector was assigned 240 vehicles per day.
- As in test system two, increased travel speeds along north Harrison Avenue and Park Street resulted in corresponding increases in traffic flow.

ALTERNATE SYSTEM THREE (3)

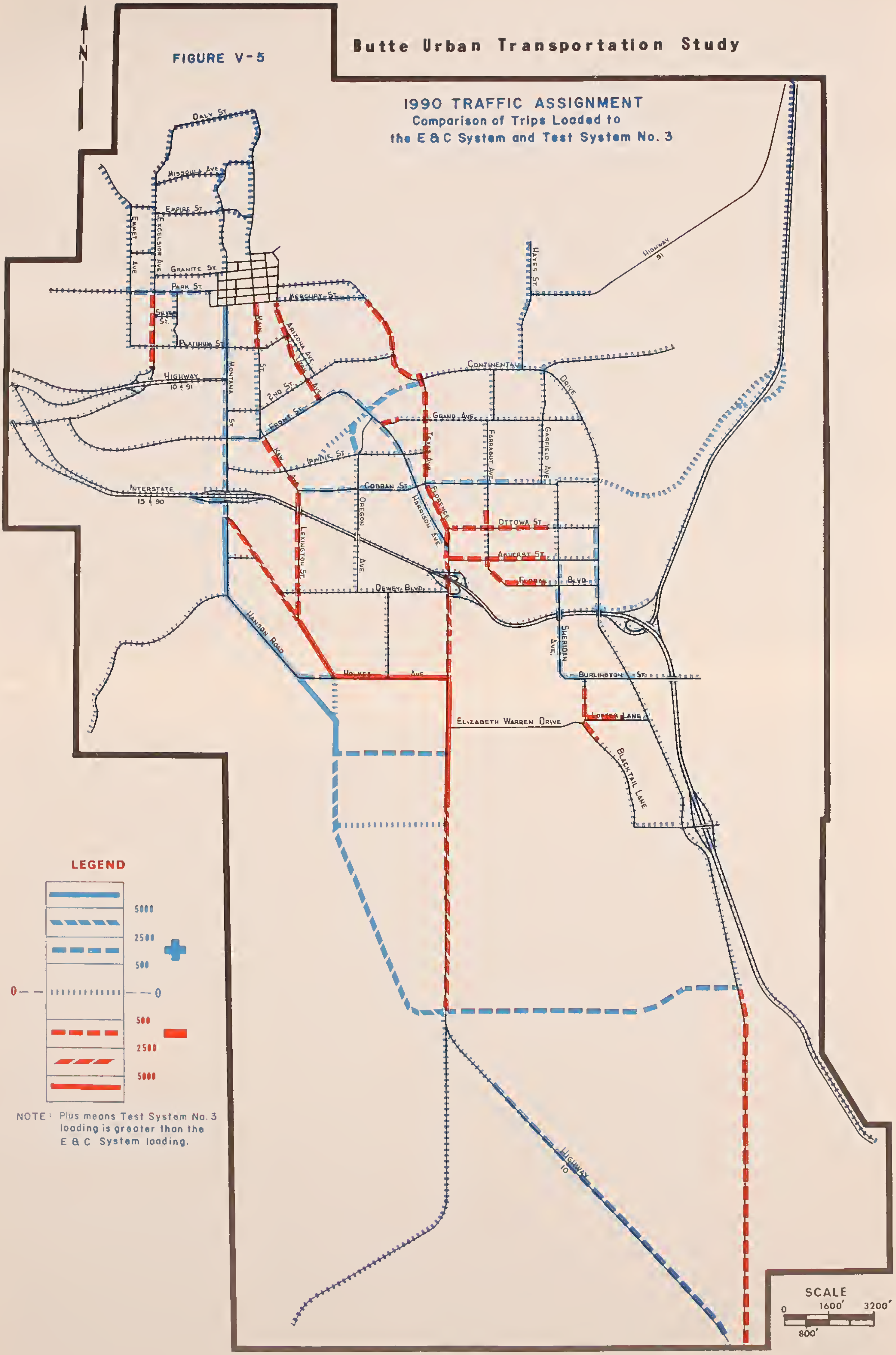
Node numbers utilized for the third system ranged from 1000-1099, and are exhibited in Figure A-6 in the Appendix. Coded travel speeds were nearly the same as for the previous system; deviations are discussed in subsequent paragraphs.

By the time the first two alternate highway systems had been tested and analyzed, only minor revisions were necessary for the third system. For this reason, the discussion of network changes and assignment results will be combined.

Network Revisions and Traffic Assignment Results

Figure V-5 illustrates a comparison of 1990 trips assigned to the existing plus committed system and to alternate test system three. Specific network changes (from system two) and resulting loadings are given below:

- Western Beltway was retained and it loaded with up to 6,100 vehicles per day.
- Southern Beltway was added. It is a continuation of the Western Beltway from Harrison Avenue to Continental Drive and is located south of the airport. Just over 1,000 vehicles per day were assigned to this connection. Port of Butte officials estimate 600 truck trips to/from the Port by 1990 with 60 percent of these eastbound. This connector would serve as a truck route removing heavy traffic from Harrison Avenue.
- The Lowell Street extension from Harrison Avenue eastward to Blacktail Lane was not considered feasible due to runway clearances. It was eliminated.
- The east-west route just south of IR15-90, between Harrison Avenue and Continental Drive, was retained. However, instead of extending Hannibal Street west to Harrison Avenue



Butte Urban Transportation Study

FIGURE V-5

1990 TRAFFIC ASSIGNMENT

Comparison of Trips Loaded to the E & C System and Test System No. 3

NOTE: Plus means Test System No. 3 loading is greater than the E & C System loading.

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Wharton Street, which is located just two blocks further north, was extended. This route loaded well with up to 6,900 vehicles per day.

- The Columbia Gardens interchange was retained, but the intersection with Continental Drive was moved from Grand Street to Cobban Street. At the same time, improvements to the Cobban Street - Kaw Avenue - Main Street corridor were assumed and travel speeds were increased from two (2) to five (5) miles per hour. Results indicated that the interior streets, i.e. Main, Kaw, and Cobban did show slight traffic increases, but the proposed interchange still loaded with only 230 vehicles per day.

- One new route was added to the system. It extends from Texas Avenue to Harrison Avenue to Kaw Avenue and passes adjacent to the Civic Center. The assignment indicated 3,000 vehicles per day to the east of Harrison Avenue and 600 vehicles per day to the west of Harrison Avenue.

THE 1990 RECOMMENDED SYSTEM

The series of test systems and adjustments outlined in the previous section resulted in a final street and highway network that would adequately serve present and future needs. The primary consideration in the computer testing process is the route location which will enable traffic to travel from point to point in the shortest time. Before a final, recommended system can be arrived at it is necessary to also take into consideration the following factors:

- Goals and objectives of the City-County Planning Board
- Financial feasibility
- Construction feasibility
- Socio-economic impact
- Environmental impact

Each of these factors was considered with regard to each improvement tested. With the exception of two projects, the improvements tested in alternate highway system three (3) are recommended for inclusion in the 1990 plan. The Columbia Gardens Interchange Route and the east-west collector immediately south of IR15-90 (extension of either Hannibal Street or Wharton Street) are not recommended. Each is discussed below.

Columbia Gardens Interchange and Connector

The interchange analyzed is located on proposed IR15 approximately 1.3 miles north of the IR15 and IR90 interchange. It is a half diamond with a southward exit-ramp and a northbound entrance-ramp. Two alternatives were tested; alternate one joined Continental Drive at Grand Avenue requiring a connecting route 1.90 miles long; alternate two joined at Cobban Avenue requiring a 1.61 mile connecting link.

A benefit/cost analysis was carried out for alternate two, assuming construction in 1975 and a twenty (20) year useful life. Benefits derived from the proposed interchanges were calculated based on the extra distance required for 230 vehicles per day (i.e. 83,950 vehicles per year) to travel to the Harrison Avenue interchange and on local streets to Continental Drive. The extra distance and time are 3.35 miles and 5.09

minutes, respectively. The U. S. Department of Transportation estimated average travel costs at approximately 13 cents per mile in 1972. Assuming an increase of four (4) percent per year, travel costs would be 21.6 cents per mile in 1985, midway through the useful project life. Average annual benefits are calculated as follows:

Average Annual Benefits = (\$0.216/vehicle-mile)(3.35 miles)(vehicle days)

(365 days a year) = \$60,746/year

A 1973 cost estimate was made for alternate two (2).

Interstate crossing	\$ 330,000
Connecting route construction	1,294,000
Right-of-Way	75,000
Railroad Crossing	126,000
Signing, fencing, drainage, guardrails	111,000
Engineering, contingencies, miscellaneous	279,000
1973 Total Cost	\$2,215,000

Assuming construction in 1975, the total cost is estimated at \$2,215,000.

Assuming an interest rate of nine (9) percent, and a twenty (20) year useful life, the annual project cost is:

Average Annual Project Cost = (\$2,215,000)(.109655) = \$242,289.

Comparing annual benefits to costs:

$$\frac{\text{Annual Benefit}}{\text{Annual Cost}} = \frac{60,746}{242,289} = 0.251$$

Since the derived benefits do not outweigh the costs, the project is not justified as a federal aid project based on economic considerations alone.

The Butte - Silver Bow City - County Planning Board has expressed a desire for this route to serve local access. Benefits to residents located north of IR15-90 and between Harrison Avenue and Continental Drive as well as to the Anaconda Company are evident. Although the project is not recommended in this plan, the Federal Highway Administration has stated that local funds could be used to construct the facility. The first step to be taken would be to request an access point to Interstate 15 for proposed interchange. Funding of the project could possibly be a joint effort by local government and the Anaconda Company. The expansion of mining activities in the vicinity of Columbia Gardens will sever access from the north to the area that would be served by the interchange.

Extension of Wharton Street to Connect Harrison Avenue with Continental Drive

This east-west route is located immediately south of Interstate 15-90 and would pass adjacent to the Plaza Shopping Center. It carried a 1990 traffic volume of up to 6,900 vehicles per day. Approximately 3,500 vehicles per day were diverted from Harrison Avenue south of Interstate 15-90, which is forecast to carry 24,500 vehicles per day by 1990.

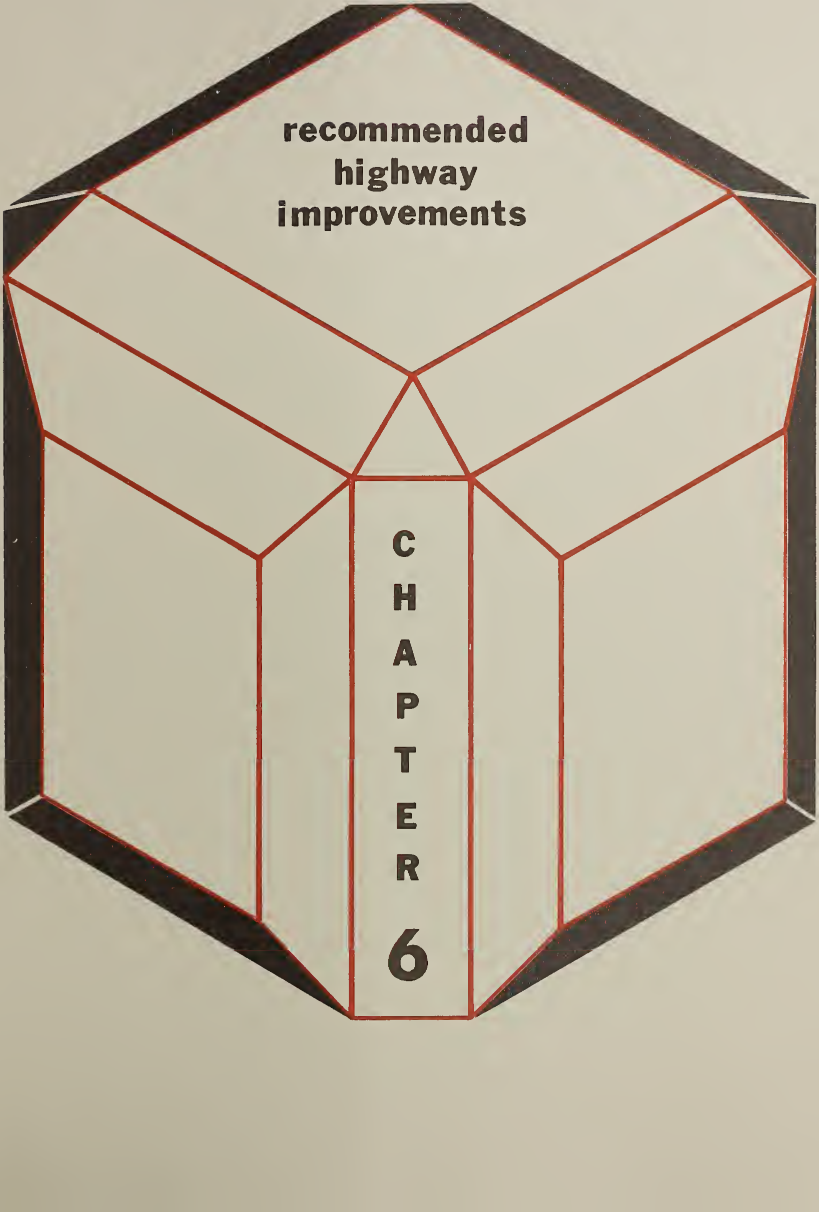
The route is not recommended because the following land use, economic and operational factors outweigh the user benefits of this route.

- The route would penetrate a residential area.

- The route would create a fragment of land between the interstate and residential development that would invite commercial growth which is not considered desirable.

- Right-of-way requirements would include several residences, a portion of a golf course, a portion of a nursery and commercial land fronting on Harrison Avenue.
- The connection of the route to Harrison Avenue would require signalization at a location that would hinder the access to the Plaza Shopping Center.

Three alternate east-west connectors between Harrison Avenue and Continental Drive are discussed in Chapter VI of this report.



recommended highway improvements

CHAPTER 6

Chapter VI

RECOMMENDED HIGHWAY IMPROVEMENTS

GENERAL

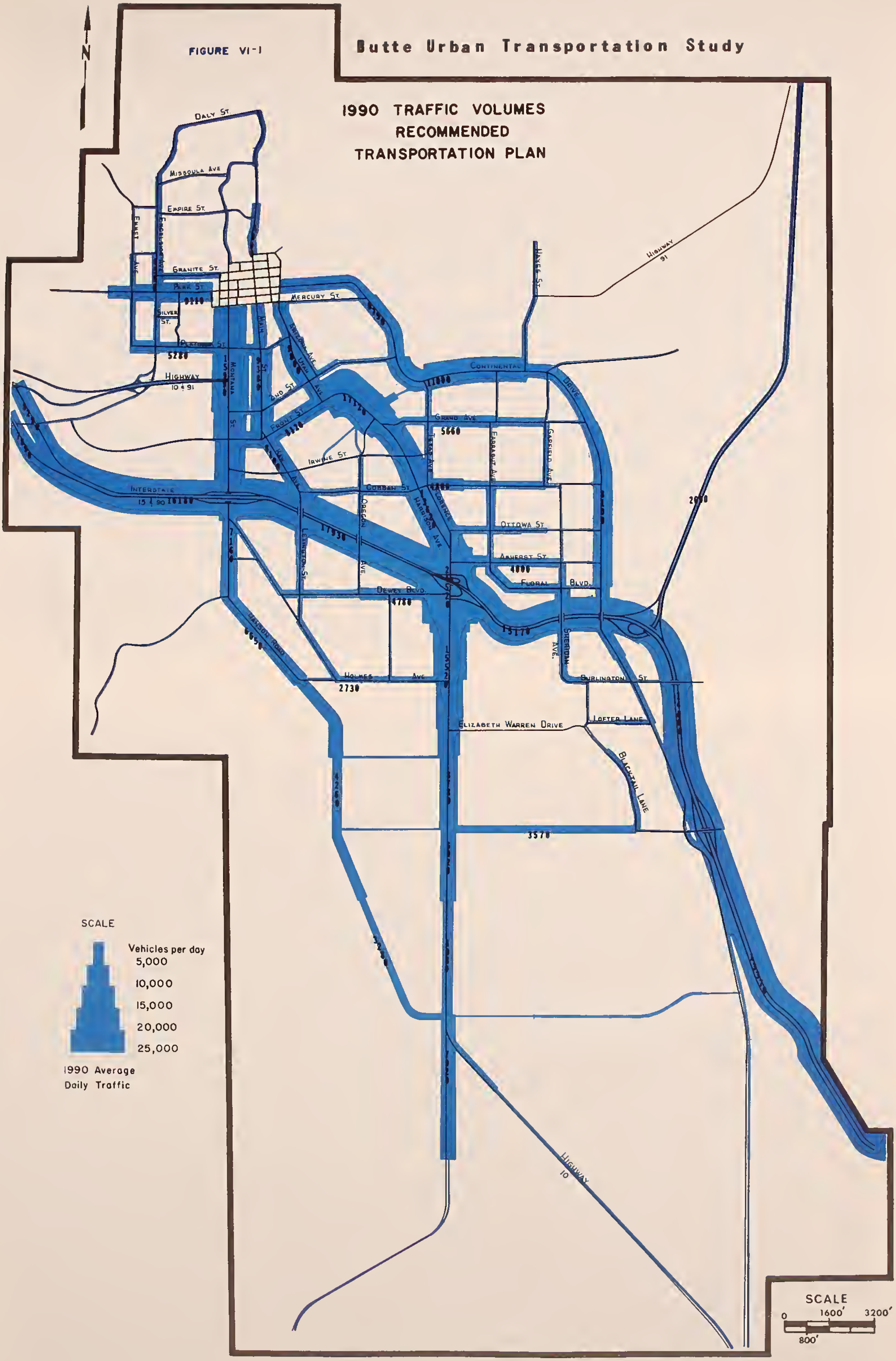
Traffic flow on the recommended 1990 highway system is displayed in Figure VI-1. By comparing this map with 1973 volumes, shown in Figure II-4, traffic increases and decreases on the major street system can be determined. Improvements recommended in this chapter are aimed at relieving future street capacity deficiencies, eliminating traffic conflicts, and providing efficient and safe movement of traffic and pedestrians.

Vehicle desire lines were analyzed for 1970 and 1990 in an effort to determine which corridors show the greatest traffic increases through the twenty (20) year planning period. Table A-2 in the Appendix is a matrix showing, for each zone, the origins and destinations of 1990 trips. By comparing this matrix with a similar one for 1970 trips (presented in Tech Plan Number 1), vehicle desire lines for the two (2) points in time were examined. The results are displayed in Figure VI-2. Trip interchanges between each major district increase between 1970 and 1990. The greatest increases are observed between districts B & C and B & D. This is due to large population increases in district B and expansion of commercial and industrial activities along Harrison Avenue south of the interstate. Travel across IR15-90 will continue

FIGURE VI-1

Butte Urban Transportation Study

1990 TRAFFIC VOLUMES RECOMMENDED TRANSPORTATION PLAN



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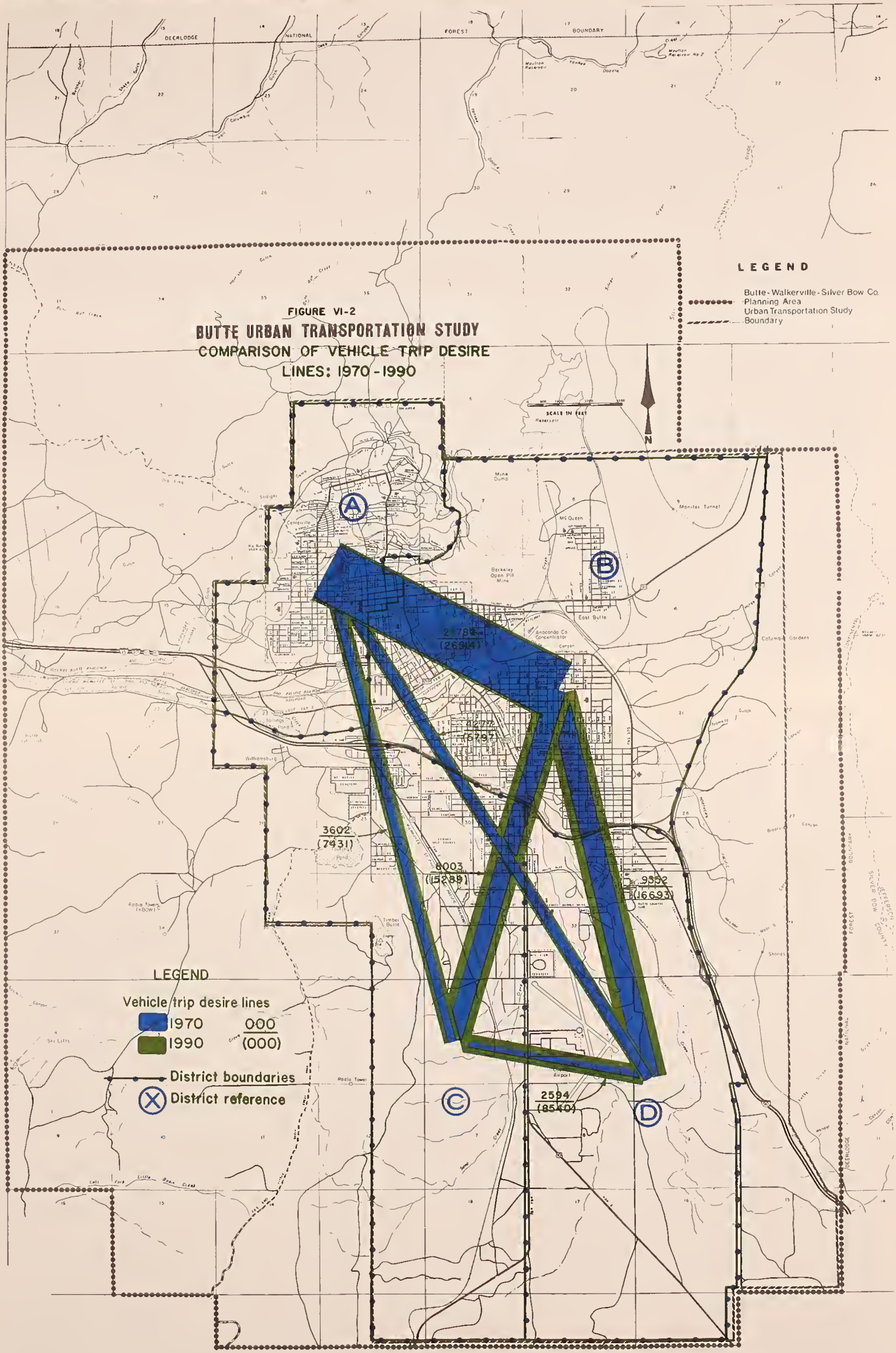

FIGURE VI-2

BUTTE URBAN TRANSPORTATION STUDY

COMPARISON OF VEHICLE TRIP DESIRE LINES: 1970-1990

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to increase, requiring improvements along this corridor to increase capacity.

Vehicle desire lines between districts C and D show an increase of 6,000 trips per day, indicating the need for improved east-west travel south of the interstate.

SUMMARY OF RECOMMENDED HIGHWAY IMPROVEMENTS

Twenty-six (26) highway projects are recommended for improvement in this transportation plan. They have been classified according to three (3) separate categories, with each project assigned a number within one of these categories. The three (3) main subdivisions along with corresponding project numbers are given below:

Project Numbers	Classification
C1 to C4	Projects Presently Committed to Construction
R1 to R16	Upgrading and Reconstruction of Existing Facilities
N1 to N6	New Highway Construction

Figure VI-3 represents a summary of the recommended highway improvements. Preoject locations are illustrated on the front; a brief description of each is given on the reverse side. Table VI-1A summarizes project costs by Federal Aid System, while Table VI-1B lists each project according to Committed construction, proposed Reconstruction, or proposed New Construction.

Table VI-1A

RECOMMENDED HIGHWAY IMPROVEMENTS

COST SUMMARY BY FEDERAL AID SYSTEM*

Federal Aid System	Estimated Cost
Interstate (proposed)	$ 1,835,000
Federal Aid Primary I	2,378,990
Federal Aid Primary II	82,390
Federal Aid Secondary	1,257,500
Local	5,851,600
Total	$11,405,480

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* Where improvement involves two routes, the project is included with the highest system, ranging from Interstate to Local.

URBAN TRANSPORTATION PLAN

BUTTE, MONTANA

SUMMARY

THE TRANSPORTATION PROBLEM

Butte, Montana originated as a prominent mining city in the latter half of the nineteenth century. Abundent gold, silver, and copper reserves were discovered, causing the population to swell to nearly 65,000 by 1916. Transportation in the early days was limited to walking, horseback and horse drawn buggy, or mass transit vehicles. Hence, most miners located near to their work resulting in a densely populated urban environment. An electric trolley system flourished, reaching its peak operation in about 1916, when 10,911, 829 passengers were transported over 34.5 miles of track. At the turn of the century, the automobile gave residents increased personal mobility, causing a decrease in transit ridership and increasing numbers of vehicles on urban roadways. Since the original roadways were not designed for automobiles, traffic conflicts mushroomed. The Butte planning area is still faced with a number of traffic conflicts which decrease efficiency and safety of the transportation system.

High density development in the "uptown" area, combined with the popularity of the automobile, has resulted in a shortage of convenient parking spaces. Parking problems in the Butte central business district, along with employment diversification in recent years have contributed to scattered development in the southern "flats" area. Figure VI-2 indicates that there is considerable travel between the north and south sections of the urban area. Harrison Avenue is the central travel corridor with volumes of up to 18,000 vehicles per day. Harrison Avenue is expected to have insufficient capacity in four to five years.

Over 17% of the area's residents are in excess of sixty years old. Many are dependent upon mass transit for mobility. The existing transit operation is in serious financial trouble due to decreasing ridership and constantly rising operating costs.

TRANSPORTATION PLANNING

An urban transportation study was initiated in 1970. Socio-economic variables, such as population, employment, and the number of households were determined and related to existing travel patterns. 1970 population was 39,433 while households number 13,680, resulting in 2.88 residents per occupied dwelling unit. Area residents made 107,880 vehicle trips per day, or 7.88 trips per household and 2.74 trips per person.

Socio-economic variables were forecasted for 1990 in the Butte-Silver Bow County Comprehensive Plan. These forecasts were distributed in accordance with a 1990 Land Use Plan, illustrated in Figure IV-3. Using these distributions, it was possible to predict future travel and to study upcoming highway problems. A number of alternate solutions were examined and a set of recommendations were developed. Recommended highway, central business district parking, and mass transit improvements are described in detail in Chapters VI, VII, and VIII, respectively. Recommended highway improvements are summarized on the following page.

Table VI-1A

RECOMMENDED HIGHWAY IMPROVEMENTS

COST SUMMARY BY FEDERAL AID SYSTEM*

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Interstate (proposed)	$ 1,835,000
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* Where improvement involves two routes, the project is included with the highest system, ranging from Interstate to Local.

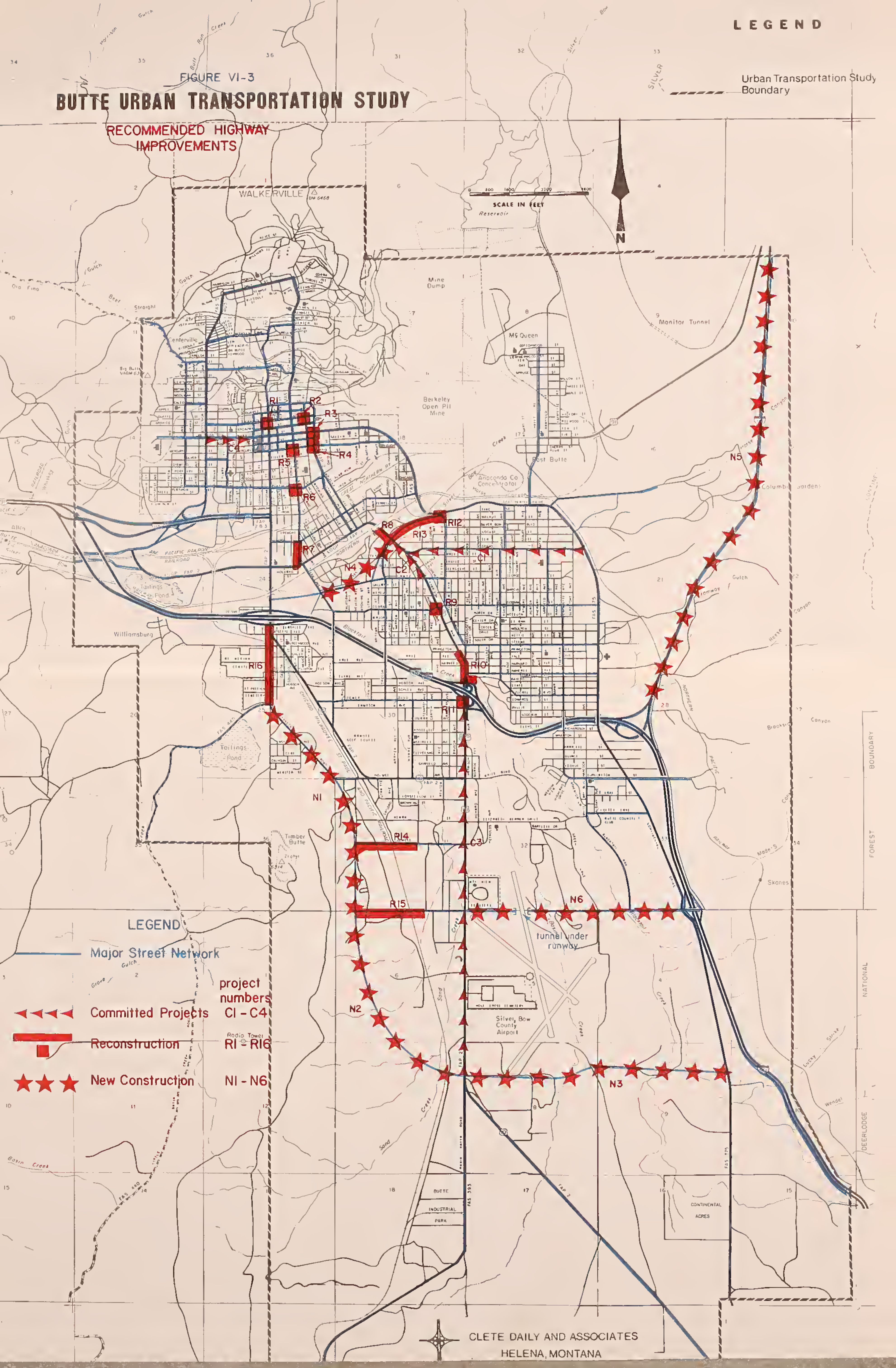

FIGURE VI-3

BUTTE URBAN TRANSPORTATION STUDY

RECOMMENDED HIGHWAY IMPROVEMENTS

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

URBAN TRANSPORTATION PLAN

BUTTE, MONTANA

SUMMARY

THE TRANSPORTATION PROBLEM

Butte, Montana originated as a prominent mining city in the latter half of the nineteenth century. Abundent gold, silver, and copper reserves were discovered, causing the population to swell to nearly 65,000 by 1916. Transportation in the early days was limited to walking, horseback and horse drawn buggy, or mass transit vehicles. Hence, most miners located near to their work resulting in a densely populated urban environment. An electric trolley system flourished, reaching its peak operation in about 1916, when 10,911, 829 passengers were transported over 34.5 miles of track. At the turn of the century, the automobile gave residents increased personal mobility, causing a decrease in transit ridership and increasing numbers of vehicles on urban roadways. Since the original roadways were not designed for automobiles, traffic conflicts mushroomed. The Butte planning area is still faced with a number of traffic conflicts which decrease efficiency and safety of the transportation system.

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Socio-economic variables were forecasted for 1990 in the Butte-Silver Bow County Comprehensive Plan. These forecasts were distributed in accordance with a 1990 Land Use Plan, illustrated in Figure IV-3. Using these distributions, it was possible to predict future travel and to study upcoming highway problems. A number of alternate solutions were examined and a set of recommendations were developed. Recommended highway, central business district parking, and mass transit improvements are described in detail in Chapters VI, VII, and VIII, respectively. Recommended highway improvements are summarized on the following page.

RECOMMENDED HIGHWAY IMPROVEMENTS

Harrison Avenue Corridor (Project Numbers: R8, R9, R10, R11, C2, C3) - Six improvements are recommended. They are located along the entire corridor from Front Street to Basin Creek Road. The intent of these proposed improvements is to increase capacity, eliminate bottlenecks and increase traffic safety throughout the entire corridor. If at all possible, these projects should be considered together and carried toward implementation simultaneously.

Main Street Corridor (Project Numbers: R5, R6, R7) - There are three major streets providing access to the central business district from the south - Montana Street, Arizona/Utah Avenues, and Main Street. The first two routes have been improved in recent years and provide adequate service. The three Main Street improvements are intended to offer motorists a third free-flowing corridor to the central business district; they should be implemented simultaneously and as soon as possible.

Uptown Improvements (Project Numbers: R1, R2, R3, R4) - Improvements are recommended at four (4) intersections. The intent is to increase right turn radii and provide standard signals and pavement markings, resulting in increased travel efficiency and increased motorist and pedestrian safety. These improvements should be implemented as soon as possible.

Urban Beltway and Related Highway Connections (Project Numbers: R14, R15, R16, N1, N2, N3) - This proposed beltway will provide for north-south travel on the west edge of the south urban area, thus offering some relief to Harrison Avenue. It should be designed as a truck route to serve industrial development presently expanding south of Interstate 15-90. Planning for this route should be initiated as six (6) to ten (10) years will be required prior to construction.

Grand Avenue and Park Street (Project Numbers: C1 and C4) - These recommended improvements are currently included in the Highway Department's five year improvement program. Improvements call for reconstruction to two and four lanes, respectively.

East-West Collector Route Near Civic Center (Project Numbers: R13, R14) - The purpose of this route is to provide for improved east-west travel between Texas Avenue, Harrison Avenue, Kaw Avenue, and Montana Street. It will serve mining employees to the east, the Civic Center, U. S. Post Office, commercial development along Harrison Avenue, and residential areas to the west.

Intersection of Continental Drive and Texas Avenue (Project Number R12) - Traffic volumes are expected to increase at this intersection and channelization is recommended. Improvements are graphically displayed in Figure VI-16.

Proposed Interstate 15 (Project Number N5) - Addition of two travel lanes to meet interstate standards is recommended, provided that the Butte-Basin-Boulder route is the selected route for Interstate 15.

Tunnel Route Across Bert Mooney Airport (Project Number N6) - There is a lack of an adequate east-west connector south of Interstate 90. If the airport is retained in its present location, Four Mile Road should be extended directly across the airport (via a tunnel) to connect with Blacktail Lane and Interstate 90.

Table VI-1B

RECOMMENDED HIGHWAY IMPROVEMENTS

Project Number	Location	Improvements	Average Daily Traffic 1973	Average Daily Traffic 1990	Federal Aid System	Estimated Cost	Priority
			COMMITTED PROJECTS				
C1	Grand Street: Harrison Ave. - Continental Dr.	Reconstruct two (2) lanes	5,600	6,400	FAP II & FAS	$ 675,000	1
C2	Harrison Ave.: Olympia St. to George St.	Reconstruct to four (4) standard lanes	14,100	15,300	FAP I & II	$ 83,000	1
C3	Harrison Ave.: IR15-90 to Basin Creek Rd.	Widen and Reconstruct to four (4) lanes	1,600 to 15,000	5,000 to 21,000	FAP I & II	$ 2,200,000	1
C4	Park St.: Excelsior Ave. to Montana St.	Widen and Reconstruct to four (4) lanes	5,600	Up to 9,000	FAP II & FAS	$ 360,000	1
					Subtotal:	$ 3,318,300	
			UPGRADING AND RECONSTRUCTION				
R1	Montana St. & Granite St.	Upgrade signal	5,800/5,150	Approximately the same as for 1973	FAP II	$ 15,360	2
R2	Wyoming St. & Granite St.	Upgrade signal	2,830/4,900		FAP II	$ 15,360	2
R3	Arizona Ave. & Park St.	Increase right turn radii	9,050/4,500		FAP I & II	$ 2,000	2

Table VI-1B (continued)

RECOMMENDED HIGHWAY IMPROVEMENTS

Project Number	Location	Improvements	Average Daily Traffic 1973	Average Daily Traffic 1990	Federal Aid System	Estimated Cost	Priority
R4	Arizona Ave. & Mercury St.	Increase right turn radii	10,250/4,530	Approximately the same as for 1973	FAP I & II	$ 1,600	2
R5	Main St. & Mercury St.	Upgrade signal	6,050/6,200		FAP II	$ 15,360	1
R6	Main St. & Platinum St.	Upgrade signal	5,800/3,150	8,000/4,300	FAP II	$ 15,360	1
R7	Main St. & Second St.	Widen to four (4) lanes and remove signal	5,390/3,400	9,380/1,500	FAP II	$ 20,950	1
R8	Harrison Ave.: Front St. to Olympia St.	Limit access & construct raised median	19,400	17,120	FAP I & II	$ 44,390	1
R9	Harrison Ave. & Cobban St.	Add left turn lane and widen Cobban St.	15,290/4,010	13,620/6,600	FAP I & II	$ 17,900	1
R10	Harrison Ave.: Yale Ave. to Cornell Ave.	Add left turn lane and upgrade signal	19,150	24,000	FAP I & II	$ 21,150	1
R11	Harrison Ave. & Dewey Blvd.	Add northbound left turn signal	17,700/3,580	24,500/4,780	FAP I & II	$ 1,400	1

Table VI-1B (continued)

RECOMMENDED HIGHWAY IMPROVEMENTS

Project Number	Location	Improvements	Average Daily Traffic		Federal Aid System	Estimated Cost	Priority
			1973	1990			
R12	Continental Dr. & Texas Ave.	Channelize turning movements	7,050/3,000	9,500/4,000	FAP I & II	$ 7,250	2
R13	Civic Center Collector: Harrison Ave. to Texas Ave.	Reconstruct two (2) lanes	NA	3,000	local	$ 154,800	3
R14	Lowell St.: Highway Dept. to proposed Western Beltway	Reconstruct two (2) lanes and railroad crossing	NA	1,800	local	$ 149,400	3
R15	Four Mile Rd.: Safeway to Proposed Western Beltway	Reconstruct two (2) lanes and railroad crossing	NA	1,200	local	$ 99,600	3
R16	Montana St.: Rowe Road to Hanson Road	Reconstruct two (2) lanes	1,970	7,160	FAP II & FAS	$ 222,500	2
					Subtotal:	$ 804,380	

Table VI-1B (continued)

RECOMMENDED HIGHWAY IMPROVEMENTS

Project Number	Location	Improvements	Average Daily Traffic		Federal Aid System	Estimated Cost	Priority
			1973	1990			
N1	Hanson Road: Montana St. to Holmes Ave.	Construct two (2) lanes to higher standard	600	6,900	Local	$ 277,500	2
N2	Western Beltway: Holmes Ave. to Harrison Ave.	Construct two (2) traffic lanes	------	4,800	Local	$ 1,078,600	2
N3	Southern Beltway: Harrison Ave. to Continental Dr.	Construct two (2) traffic lanes	------	1,000	Local	$ 811,800	2
N4	Civic Center Collector: Kaw Ave. to Harrison Ave.	Construct two (2) traffic lanes	------	700	Local	$ 497,100	1
N5	Interstate 15: Junction IR15 & IR90 to NE. Study Area Boundary	Add two (2) traffic lanes to interstate	700	2,700	FAP & Proposed Interstate	$1,835,000	1
N6	Extension of Four Mile Rd. across county airport	Construct two (2) lanes & tunnel under runway #15-33	-------	3,570	Local	$ 2,782,800	4
					Subtotal:	$ 7,282,800	
					TOTAL:	$11,405,480	

NA = Not Applicable

PROJECT COSTS

The construction of each improvement was estimated using the unit costs tabulated in Table VI-2. They were then increased by 28 percent - 18 percent for engineering and contingencies and 10 percent for miscellaneous costs. Land acquisition costs were estimated using recent land sales data supplied by the Right of Way Section of the Montana Department of Highways.

Table VI-2

UNIT CONSTRUCTION COSTS

Work Activity	Unit	Unit Cost
Clearing, Grubbing and Demolition	acre	$ 1,040.00
Salvaging and Replacing Topsoil	yd^3	4.00
Excavation (street)	yd^3	2.50
Embankment	yd^3	1.60
Storm Drainage (construction of)	lineal foot	18.20
Surface and Base (heavy trucks)	yd^2	8.00
(light trucks and passenger cards)	yd^2	5.30
Remove and Reset Power Poles	each	600.00
Widen Existing Roadway (one side - includes remove curb and gutter, excavate, rebuild pavement and utility changes)	yd^2	13.00
Construct 16 Foot Raised Concrete Median	lineal foot	14.50
Curb and Gutter	lineal foot	4.00
Concrete Sidewalk (4" thick)	yd^2	5.65
Signing and Striping (open highway without parking)	mile	1,300.00
(Intersection of approximately 1,000 foot length)	each	650.00
Lighting	mile	43,000.00
Drainage	mile	7,000.00
Structures	ft^2	23.00
Signalization	each	12,000.00
Landscaping	mile	780.00
Guard Rail (steel with wood posts)	lineal foot	5.50
Railroad Crossing (construction of)	each	10,000.00
(signalization)	each	15,000.00
Engineering and Contingencies	% of construction	18.0%
Miscellaneous	% of construction	10.0%
Right - of - Way	acre	Variable

PRIORITIES

Each of the twenty-six (26) recommended highway improvements has been assigned a priority number ranging from one (1) to four (4). These numbers correspond to time periods within the transportation planning study period, 1970-1990. They are as follows:

Table VI-3

NUMBER OF PROJECTS BY PRIORITY TIME PERIOD

Priority	Time Period	Number of Projects
1	1970-1975	13
2	1975-1980	8
3	1980-1985	4
4	1985-1990	1
	Total	26

It is emphasized that due to the length of time required for planning, design and right-of-way acquisition, these time periods are approximate. Actual priorities within each individual time frame will be dependent upon local emphasis and should be established on a short-term continuing study basis. Input will be required from the Transportation Technical Advisory Committee, the Policy Committee, Silver Bow County Commissioners, and local citizens.

Projects recommended in this plan result from substandard physical and operational equipment, existing traffic conflicts, and expanding residential, commercial and industrial development.

Each of the four (4) committed projects have been assigned priority 1.

Three (3) projects on Main Street and five (5) on Harrison Avenue are assigned priority 1 because of high cost/benefit ratings. These improvements are designed to correct existing bottlenecks along the entire corridor, and should be implemented simultaneously.

Since commercial development is planned in the area just south of the Albertson's store on Harrison Avenue, priority 1 is assigned to the collector route between Kaw Avenue and Harrison Avenue. The last project assigned the highest priority is IR-15; this is due to a national priority established for completion of the interstate system.

Improvements assigned priority 2 involve signal upgrading near the central business district and construction necessary to complete the Urban Beltway.

Priority 3 construction follows as a result of projects previously completed under priority 2. Only one (1) project is assigned the last priority - construction of Four Mile Road across the airport via a tunnel under runway #15-33. The reason for this low priority is because of the high construction cost and uncertainity of relocation of the existing county airport.

Each of the twenty-six recommended highway improvements are individually discussed on the following pages.

Grand Avenue: Harrison Avenue to Continental Drive

Project Number: C1

Problem: Grand Avenue is 1.4 miles long and serves as an urban two lane collector street connecting two principal arterials - Harrison Avenue and Continental Drive. Surface condition over most of the Avenue is poor, curbs exist along only one section from Monroe Avenue to Harrison Avenue, and there are no sidewalks. East Junior High School borders Grand Avenue, resulting in numerous children walking in the street.

Traffic Data: Present traffic volumes vary from 830 vehicles per day near Continental Drive to 5,600 vehicles per day near Harrison Avenue. The average traffic volume over the entire section is 3,560 vehicles per day. Traffic volumes are not expected to increase significantly through the planning period, 1970-1990.

Recommended Improvement: Silver Bow County Commissioners have assigned high priority to reconstruction of this facility to provide two standard width traffic lanes with a good base and riding surface and installation of curbs and sidewalks.

Expected Results: The primary benefits to be derived from reconstruction of Grand Avenue will be smoother and more efficient traffic flow for motorists, and increased pedestrian safety. Values of abutting property will also be enhanced by the improved collector street.

Estimated Cost: $675,000

Priority: 1

Harrison Avenue: Olympia Street to George Street

Project Number: C2

Problem: The physical characteristics of this roadway section are illustrated in the following table:

Table VI-4

HARRISON AVENUE PHYSICAL CHARACTERISTICS

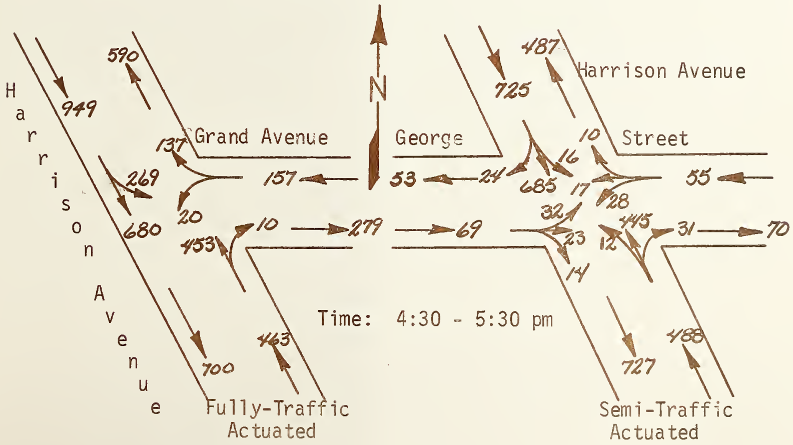
OLYMPIA STREET TO GEORGE STREET

Roadway Section	R/W (feet)	C-C (feet)	Number Lanes	Lane Width (feet)	Travel Width (feet)
Olympia to Grand	85-90	65.8	5	Varies	57.8
Grand to Dundee	80-85	61.0	4 to 5	10.0	40.0
Dundee to George	80	55.0	4	10.0	40.0

Travel lane widths between Grand Avenue and George Street are less than the eleven (11) foot minimum recommended by the American Association of State Highway Officials. The boulevard on the west side of the street, from Olympia Street to Dundee Street, has been removed for parking.

A separate left turn bay is provided at the intersection of Grand Avenue. However, left turns are permitted at each intersection and at commercial establishments. Delay and congestion are common due to stopped vehicles attempting left turns.

Traffic Flow and Capacity: The 1973 average daily traffic for all major roadways in the Butte urban area is illustrated in Figure II-4. Projected 1990 average daily traffic for Harrison Avenue are shown in Figure VI-1; they are nearly equal to those for 1973, indicating that Harrison Avenue will continue to serve as an important arterial in the major street system and that four travel lanes will be required through 1990. Peak hour traffic flow was measured in 1971 at the significant intersections of Grand Avenue and George Street. Counts are shown below:



All approaches have adequate capacity; however, because of narrow lanes and interference from parking maneuvers, traffic often operates in a single lane. Under such conditions, the service volume to capacity ratio is 0.90 which is Level of Service D.

Accidents: Accident records for the Butte area were examined for a three year period, 1969-1971. Table II-4 shows the accident rates for the twenty-three (23) highest locations, and this section of Harrison Avenue is not included.

Recommended Improvements: (Illustrated in Figure VI-4)

* Widen Harrison Avenue on both sides from Grand Street to George Street to provide sixty-three (63) feet curb to curb. This will permit a standard width section with four (4) - eleven (11) foot travel lanes, two (2) - nine (9) foot parallel parking lanes, and one (1) foot for the centerline. Existing curbs should be set back five (5) feet, allowing two (2) feet between the curb and sidewalk for poles and signs. The sidewalk should be extended to meet the curb where not required for poles.

* To further channelize traffic flow along Harrison Avenue, install a raised concrete median between Grand Avenue and Dundee Street; this is especially desirable during winter months when snow obscures paint markings.

Expected Results: The purpose of this project is to improve the physical and operational characteristics of the roadway section. Adequate space for on-street parking and eleven (11) foot lanes is expected to improve traffic flow and increase the twenty-four (24) hour average travel speed from 19.4 miles per hour to 22.4 to 24.4 miles per hour.

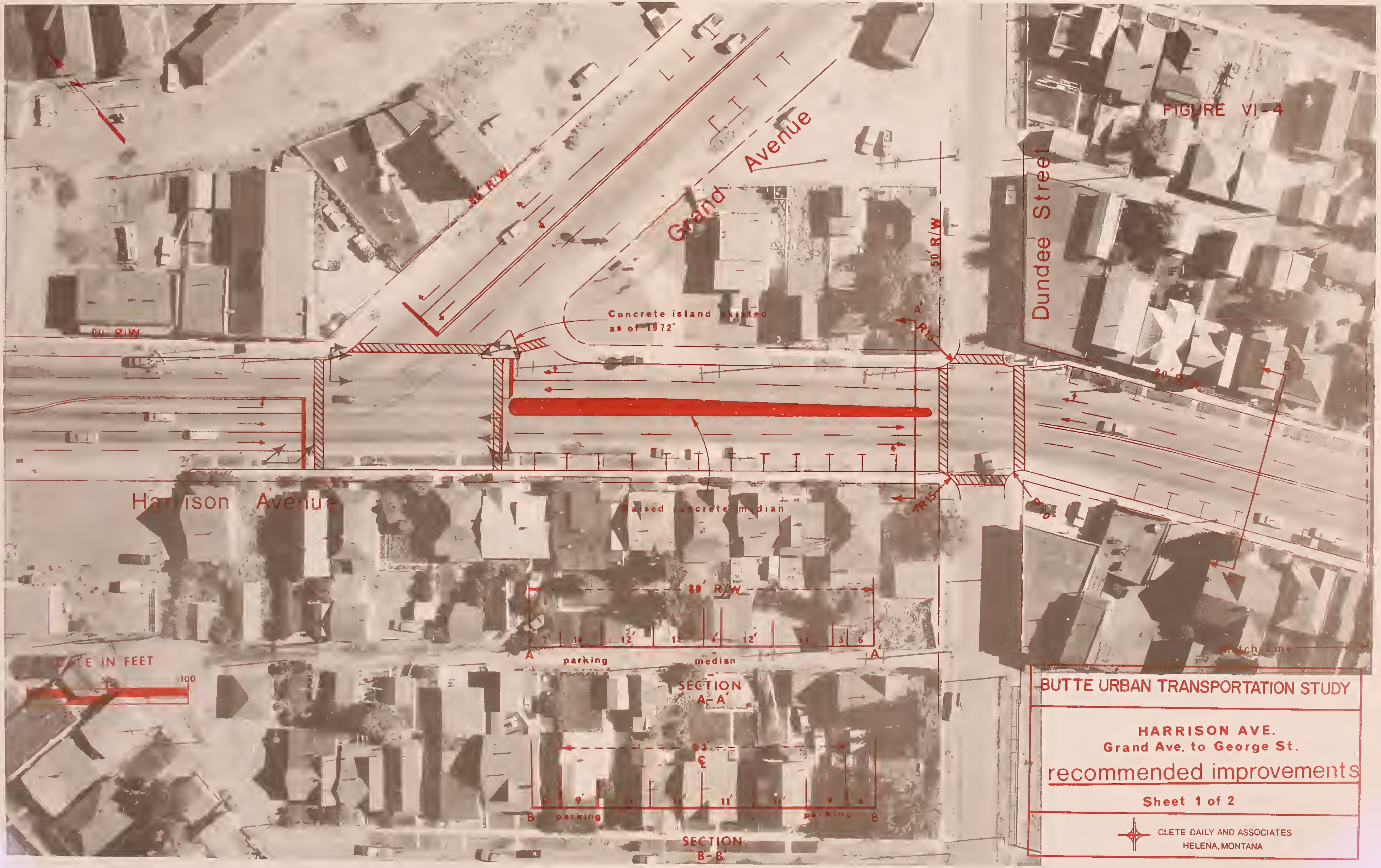
The increase in width will minimize conflicts between parked and parking vehicles reducing the service volume to capacity ratio from 0.90 to 0.75. Level of Service C will result.

Estimated Cost: $83,300

Priority: 1

Alternate Solutions: Additional curb to curb space could be attained through elimination of parking on either side of Harrison Avenue. Because of commercial activity and lack of off-street parking, this solution is not recommended.

FIGURE VI-4



BUTTE URBAN TRANSPORTATION STUDY

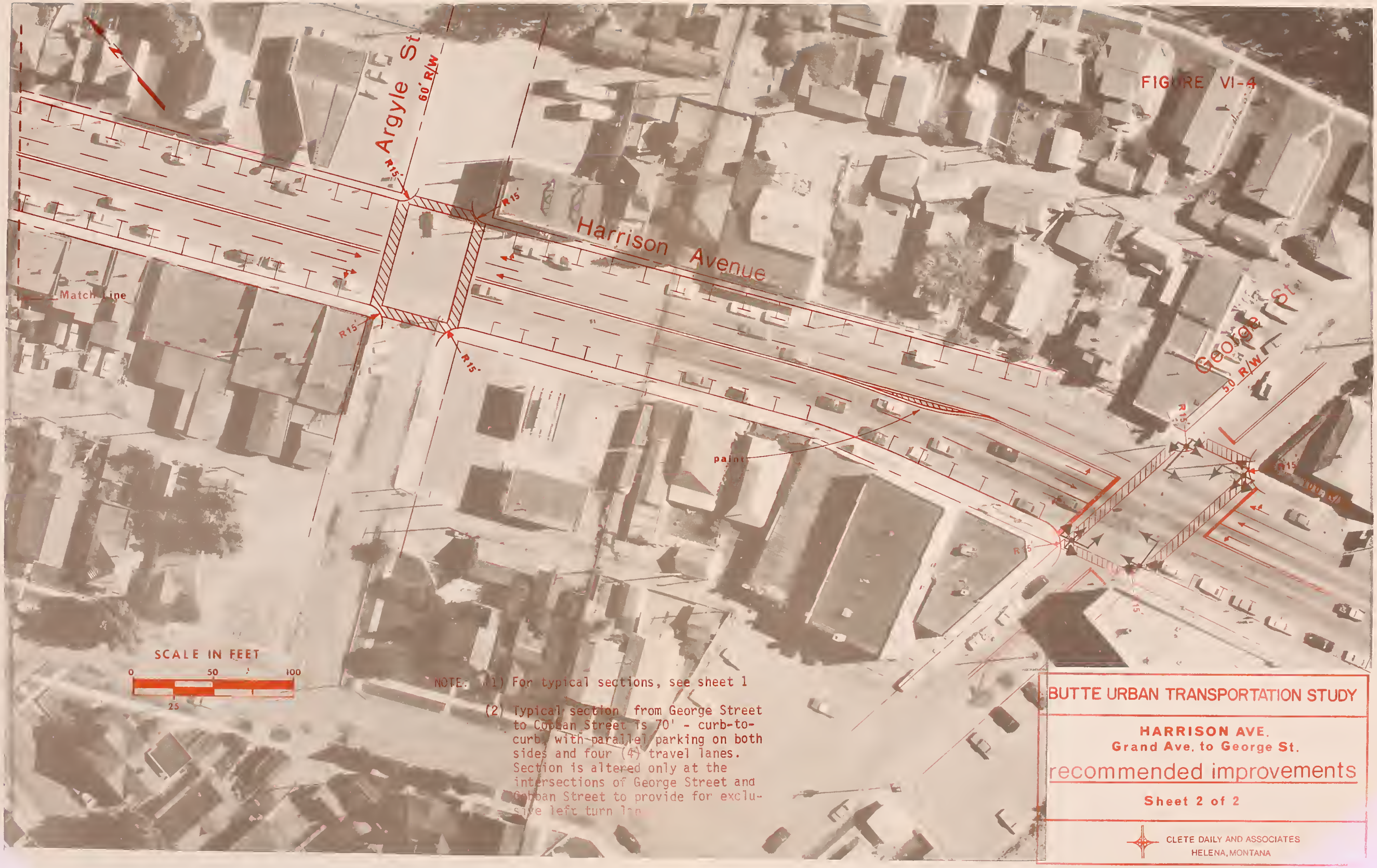
HARRISON AVE.
Grand Ave. to George St.

recommended improvements

Sheet 1 of 2

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

FIGURE VI-4



NOTE: (1) For typical sections, see sheet 1

(2) Typical section from George Street to Cobban Street is 70' - curb-to-curb, with parallel parking on both sides and four (4) travel lanes. Section is altered only at the intersections of George Street and Cobban Street to provide for exclusive left turn lanes.

BUTTE URBAN TRANSPORTATION STUDY

HARRISON AVE.
Grand Ave. to George St.

recommended improvements

Sheet 2 of 2

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Harrison Avenue: IR 15-90 to Basin Creek Road

Project Number: C3

Problem: This section of Harrison Avenue is 2.86 miles long. The roadway varies in width; the section immediately south of the interstate had been widened to accommodate four (4) travel lanes plus a raised median for protected left turns; between the Plaza Shopping Center and Holmes Avenue, adequate width exists for a left turn bay and four (4) lanes, however, pavement marking is inadequate and there are no curbs or sidewalks. South of Holmes Avenue, the pavement width narrows and two (2) travel lanes are provided; shoulders are poor, and there are no curbs or sidewalks.

Commercial activity along Harrison Avenue is quite heavy and is expanding rapidly. Numerous conflicts exist due to left turn movements.

Traffic Data: Existing average daily traffic varies from 2,100 vehicles per day near Basin Creek Road to 8,000 vehicles per day at Elizabeth Warren Drive; between Elizabeth Warren Drive and the Interstate, volumes increase from 9,000 to 15,500 vehicles per day. Traffic increases are projected due to expanding industrial, commercial, and residential land uses in the "flats" area. Average daily traffic for the recommended highway plan are illustrated in Figure VI-1.

Under existing physical and operational conditions, service volume deficiencies will soon occur between Holmes Avenue and Elizabeth Warren Drive. Assuming fifteen (15) percent right turns and left turns and no traffic signals, the existing service volume at Level C is approximately 11,500 vehicles per day. Traffic growth is averaging about six (6) percent per year. At this rate, this section will be deficient in four (4) to five (5) years. Roadway sections south of Elizabeth Warren Drive will provide adequate service for a longer period of time; however, the existing cross section is of a lower standard.

Recommended Improvements:

* The Montana Department of Highways has assigned high priority to reconstruction of South Harrison Avenue to four (4) traffic lanes. Width of lanes should be a minimum of eleven (11) feet, and preferably twelve (12) feet. Since the 1990 Land Use Plan calls for industrial and commercial uses along this arterial, a raised concrete median (minimum width of sixteen (16) feet) should be provided. Protected left turn bays should be constructed at a limited number of dedicated cross streets.

* Design of this facility should limit access points for traffic entering and exiting abutting property so that traffic conflicts will be minimized. The raised median will help limit traffic access by prohibiting left turns from each business establishment to the main stream of traffic flow.

Expected Results: In order for South Harrison Avenue to continue providing adequate service to the community, planning for reconstruction should begin immediately. The improved facility will increase the efficiency of vehicular travel in the south area as well as provide smoother and safer movement of traffic.

Estimated Cost: $2,200,000

Priority: 1

Park Street: Excelsior Avenue to Montana Street

Project Number: C4

Problem: Park Street is the primary route for access to and from the Montana Institute of Mineral Science and Technology. It is also the main east-west arterial connecting the central business district with residential areas to the west. Both uphill and downhill grades are excessive restricting sight distance. The 0.49 mile section from Excelsior Avenue to Montana Street has poor alignment and the surface condition is generally in need of repair. Parking is permitted on both sides of the street, but pavement has been patched and marking is not adequate. Sidewalks and curbs vary in condition but are generally in poor condition.

Traffic Data: The 1973 average daily traffic is 5,600 vehicles per day. Forecasted 1990 traffic is approximately 9,000 vehicles per day. This projection could turn out to be somewhat low if the Montana Institute of Mineral Sciences and Technology and the Vocational-Technical Center were to combine onto a common campus with new facilities west of the present school of mines. It is concluded that Park Street will show continued traffic growth and will continue to serve as a major transportation corridor through the planning period, 1970-1990.

Recommended Improvements:

* Silver Bow County Commissioners have assigned high priority to reconstruction of Park Street from Excelsior Avenue to Montana Street and provide two (2) - ten foot parallel parking lanes and four (4) - eleven (11) foot travel lanes. Since curb and sidewalk conditions vary according to location, they should be reconstructed where the need exists. Vaults exist beneath some sidewalks; wherever the extended curb line cuts these valuts, they should be backfilled to provide adequate support for vehicles and pedestrians.

* Traffic signals are located at Excelsior Avenue, Washington Street, Idaho Street, and Montana Street. The first three (3) signals are substandard and should be upgraded or removed. Eight (8) hour turning movement counts conducted in 1971 indicated that the traffic signal warrants were not satisfied for these three signals. However, it is possible that the hours counted should be examined during the design phase to establish need for the signals. If the warrants are not satisified, these signals should be removed.

Expected Results: This improvement will improve access from the central business district to the Montana Institute of Mineral Sciences and Technology campus. It will also upgrade access for traffic between the central business district and Walkerville.

Estimated Cost: $360,000

Priority: 1

Intersection of Montana Street and Granite Street

Project Number: R1

Problem: The existing fixed time traffic signal does not satisfy the requirements of the Uniform Manual on Traffic Control Devices. There is only one (1), four (4) way, three unit signal head mounted on a span wire that diagonally crosses the intersection. The Manual calls for a minimum of two signal faces per approach.

The intersection is located on the northern edge of the central business district. Silver Bow County Courthouse is situated on the northeast corner, with commercial establishments and apartment houses on the remaining corners. There are retired residents living in this neighborhood and many walk to the central business district. Pedestrian signals, crosswalks, and vehicle stop-lines do not exist.

Montana Street proceeds up a steep hill as it crosses Granite Street going northbound. The grades restrict sight distances at corners.

Angle parking exists along both sides of Montana Street in each direction from Granite Street. During the three year period 1969-1971, there were fifteen (15) recorded accidents at this intersection; six (6) of these, or 40 percent involved angle parked vehicles.

Traffic Data: The "Systems Warrant" for traffic signals, as outlined in the Manual on Uniform Traffic Control Devices, is satisfied. Both Montana Street and Granite Street are major routes, and in 1971, the peak hour approach volume numbered 1,089 vehicles.

Average Daily traffic for 1973 along each approach is as follows:

North - 5,000 vehicles per day
East - 5,790 vehicles per day
South - 6,600 vehicles per day
West - 4,490 vehicles per day

Since the central business district is not expected to change significantly through the planning period, projected 1990 traffic will be approximately the same as for 1973.

Recommended Improvements: (Illustrated in Figure VI-5)

* The existing controller has single dial capability. Provide a new three (3) dial signal controller and coordinate it with other existing three (3) dial controllers along Montana Street. Install pedestrian WALK/DON'T WALK signals on all four (4) corners in accordance with the Uniform Manual on Traffic Control Devices. Crosswalks and vehicle stop lines should be provided as shown in Figure VI-5.

* Remove the existing single head signal, and replace with two (2), three lens faces for each approach mounted on mast arms.

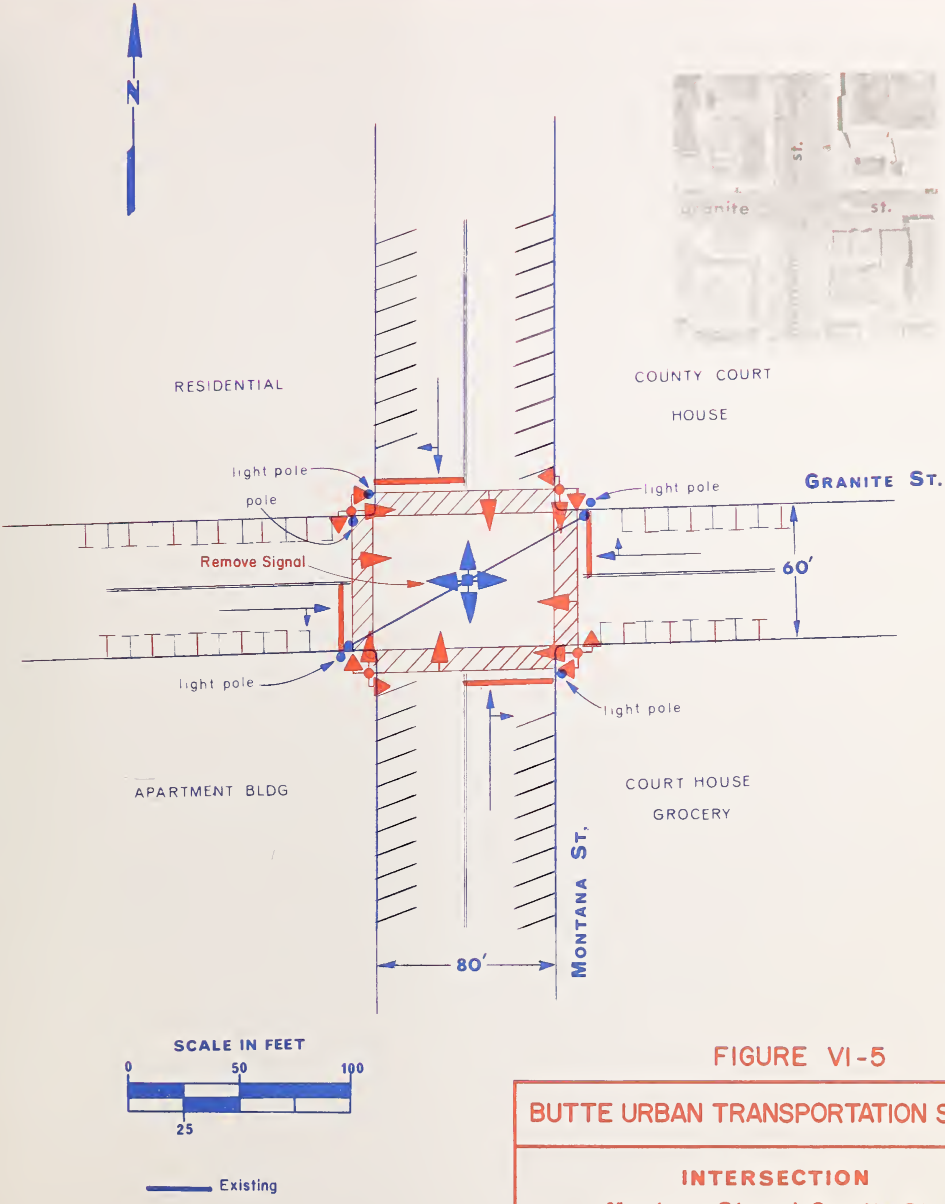


FIGURE VI-5

BUTTE URBAN TRANSPORTATION STUDY

INTERSECTION

Montana St. and Granite St.

recommended improvements

Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

These should match other recent installations (under Federal 9999 project completed in 1970) in the central business district.

* Montana Street is seventy-two (72) feet wide, which is adequate to accommodate two (2) lanes of traffic and angle parking. Parking stalls should be clearly marked. And to improve sight distance between approachs, "no parking zones" on street approaches should be enforced.

Expected Results: The primary reason for updating this traffic signal is due to its substandard nature and relatively high number of accidents during the past three years. These improvements will provide increased visibility to motorists and safer crossings for pedestrians.

Estimated Cost: $15,360

Priority: 2

Intersection of Granite Street and Wyoming Street

Project Number: R2

Problem: The existing, fixed time traffic signal does not satisfy the minimum requirements of the Uniform Manual of Traffic Control Devices. There is only one (1), four (4) way, three unit signal head. It is mounted on a span wire that diagonally crosses the intersection. The Uniform Manual calls for a minimum of two signal faces per approach.

Pedestrian counts are not available; however, this intersection is located within the central business district and commercial establishments and/or apartment houses line both sides of all four (4) approaches. There are three off-street parking lots within one-half block of this intersection. Pedestrian signals, marked crosswalks, and vehicle stop-lines do not exist.

Traffic Data: Both streets qualify as major routes; Granite Street is a major collector, whereas Wyoming Street serves as a primary artery within the central business district. The 1971 peak hour approach volume was 889 vehicles. Hence, the "Systems Warrant", as outlined in the Uniform Manual of Traffic Control Devices, is satisfied.

The average daily traffic along each approach is as follows:

North - 4,540 vehicles per day

East - 4,000 vehicles per day

South - 4,540 vehicles per day

West - 5,790 vehicles per day

Activity in the central business for 1990 is forecast at approximately the 1973 level and traffic volumes are not expected to change significantly.

Recommended Improvements: (Illustrated in Figure VI-6)

* Replace the existing controller with an updated, fixed time controller having three (3) dials. Traffic counts conducted in 1971 indicate balanced flow between adjacent approaches during the afternoon peak period. An imbalance occurred during the morning and noon peak periods, revealing a need for three (3) dial capability. Coordinate the other signals along Granite Street.

* Install pedestrian WALK/DON'T WALK signals on all four (4) corners in conformance with the Uniform Manual on Traffic Control Devices.

* Mast arms should be installed to support two (2) new signal heads per approach.

* Each approach should be marked to clearly show pedestrian crosswalks, vehicle stop-lines and appropriate lane lines and parking stalls.

* Prohibit parking to within thirty (30) feet and twenty (20) feet of a marked crosswalk on the approach and departure side of the intersection, respectively.

Expected Results: The increased number of signal heads on each approach will increase visibility for approaching motorists. This will result in safer movement of traffic.

Installation of pedestrian signals will assure pedestrians (especially the elderly) of adequate protected time for crossing the intersection. Painted crosswalks, vehicle stop-lines, and parking restrictions along each approach will provide increased division of right-of-way and responsibility between the motorists and pedestrians. The intersection will be in conformance with other signals in the central business district.

Estimated Cost: $15,360

Priority: 2

Intersection of Arizona Avenue and Park Street

Project Number: R3

Problem: Mercury Street and Park Street are the only two routes that serve the central business district from the east. Park Street connects with U.S. Highway 91 and serves as a bypass around the Anaconda Company's open pit copper mine.

The west approach to Arizona Avenue is one-way eastbound, and all westbound traffic must turn either to the north or south. A smooth turning transition is not available due to five (5) foot radii on all four corners of the intersection.

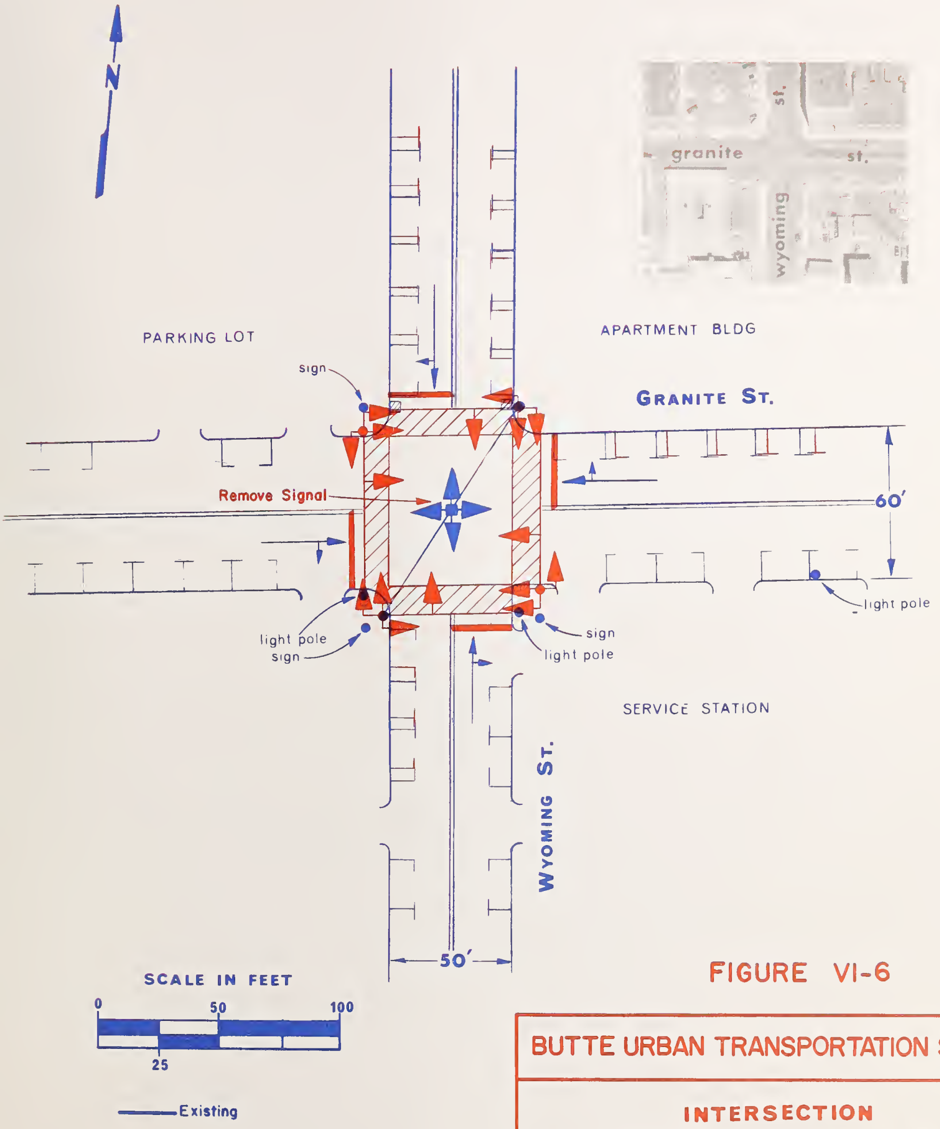


FIGURE VI-6

BUTTE URBAN TRANSPORTATION STUDY

INTERSECTION

Wyoming St. and Granite St.

recommended improvements

Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Traffic Data: Arizona Avenue and Park Street are both principal arterials. The 1971 peak hour intersection approach volume was 1,209 vehicles, surpassing the 800 approach vehicles required to satisfy the Systems Warrant in the Uniform Manual of Traffic Control Devices.

The 1973 average daily traffic for each approach is as follows:

North - 9,050 vehicles per day   East - 4,500 vehicles per day

South - 9,050 vehicles per day   West - 4,500 vehicles per day

Traffic volumes on the east approach are estimated to be 5,600 vehicles per day by 1990. The other three approaches are expected to show minor volume changes as activity in the central business district is forecast at approximately the 1973 level.

Recommended Improvements: (Illustrated in Figure VI-7)

* Increase the curb radii on the northeast and southwest corners of the intersection to fifteen (15) feet.

* Relocate two (2) light poles to provide space for curb setback.

* Pedestrian crosswalks, vehicle stop lines, and traffic lanes should be striped to clearly define pedestrian and traffic movements.

Expected Results: The primary benefits from these improvements include more efficient and smoother vehicular flow through the intersection. Since motorists will be able to negotiate right turns without crossing the centerline, vehicle conflicts will be minimized and safer flow will result.

Estimated Cost: $2,000

Priority: 2

Intersection of Arizona Avenue and Mercury Street

Project Number: R4

Problem: Curb lines on all four corners are nearly square, causing extreme difficulty in negotiating right turn movements. Vehicles slow to less than five (5) miles per hour to make these turns and often cross the centerline to increase their turn radius. Travel speeds are reduced and traffic conflicts are apparent.

The curb line along the north side of Mercury Street is offset 33 feet across the intersection causing the centerlines on east and west approaches to be staggered. The result is a head-on traffic conflict between eastbound and westbound vehicles.

Twenty-five (25) accidents were recorded at this intersection during 1969-1971, ranking it the eighth highest accident location in

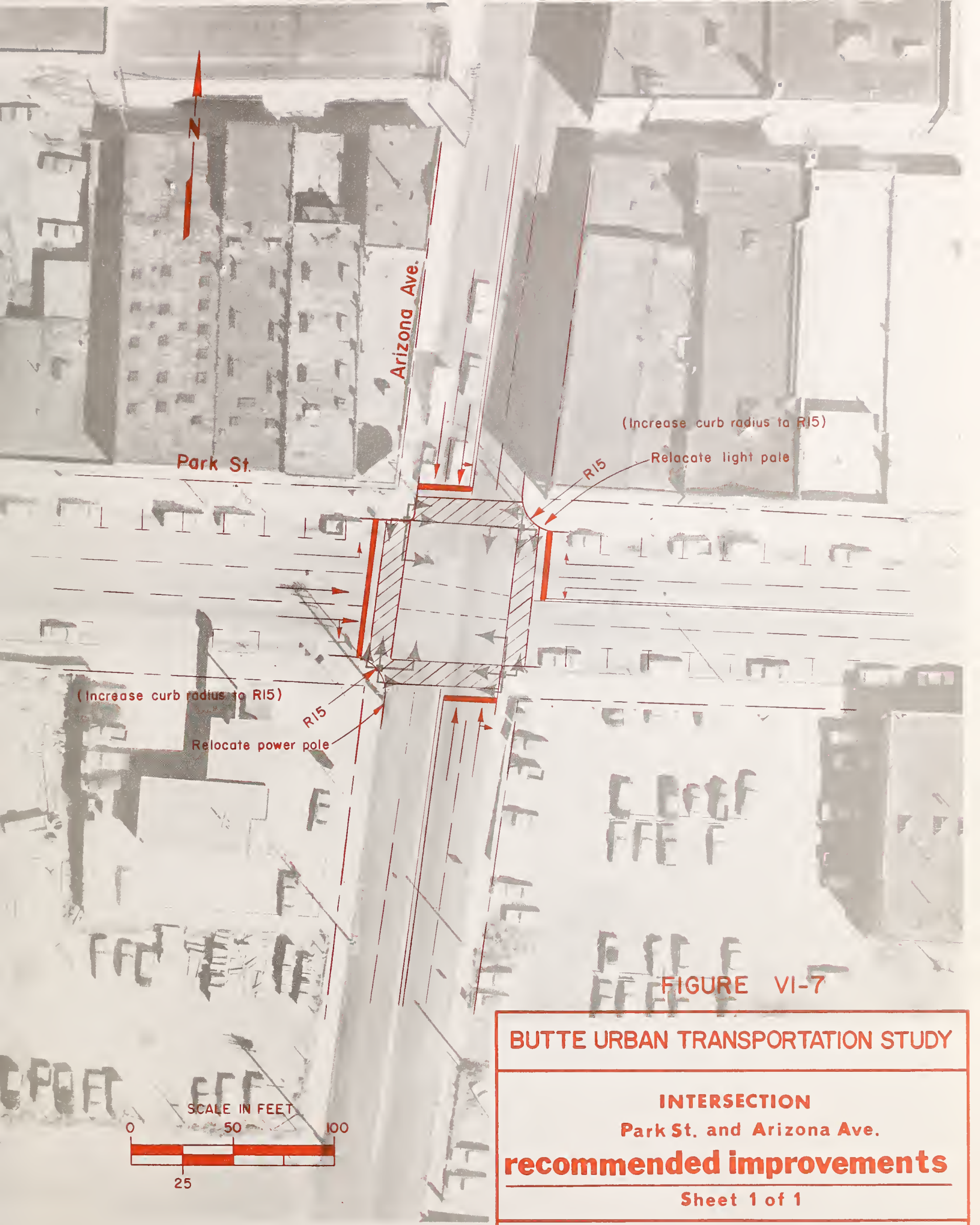


FIGURE VI-7

BUTTE URBAN TRANSPORTATION STUDY

INTERSECTION

Park St. and Arizona Ave.

recommended improvements

Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

the urban area. Eighteen (18) accidents occurred near the middle of the intersection and of those 18, twelve (12) involved turning movements.

Traffic Data: Mercury Street is an urban collector and primary access route to the central business district, and Arizona Avenue serves as a principal arterial. Both streets qualify as major routes. The 1971 peak hour intersection approach volume was 1,059 vehicles. These conditions satisfy the Systems Warrnat for traffic signals.

The 1973 average daily traffic is as follows:

North - 9,050 vehicles per day	East - 5,560 vehicles per day
South - 11,500 vehicles per day	West - 3,500 vehicles per day

Projected 1990 traffic on South Arizona Avenue is expected to decrease by up to 2,000 vehicles per day. This is due to improvements along Main Street (and a subsequent increase in use) and increased use of the Montana Street corridor resulting from development of the Western Beltway. Other approaches to this intersection are expected to show minor traffic decreases because of a shift of central business district land uses toward the west.

Recommended Improvements: (Illustrated in Figure VI-8)

* Increase the curb radii on the northeast and southwest corners of the intersection to fifteen (15) feet.

* A Montana Power utility pole is situated on the northeast corner approximately fifteen feet east of the Arizona Street curb line. In order to increase the turning radius, this pole must be relocated thirty (30) feet to the east.

* A light pole is located on the southwest corner and must be relocated to permit the curb setback.

* The centerline along Mercury Street can be lined up providing a slight curb taper on the northeast and southwest corners. These minor improvements should be constructed to help eliminate vehicle conflicts.

Expected Results: The recommended improvements involve minor physical changes to improve the operational characteristics of the intersection. Traffic conflicts will be decreased and travel speed around corners will be increased, resulting in greater operational efficiency of the intersection.

Estimated Cost: $1,600

Priority: 2

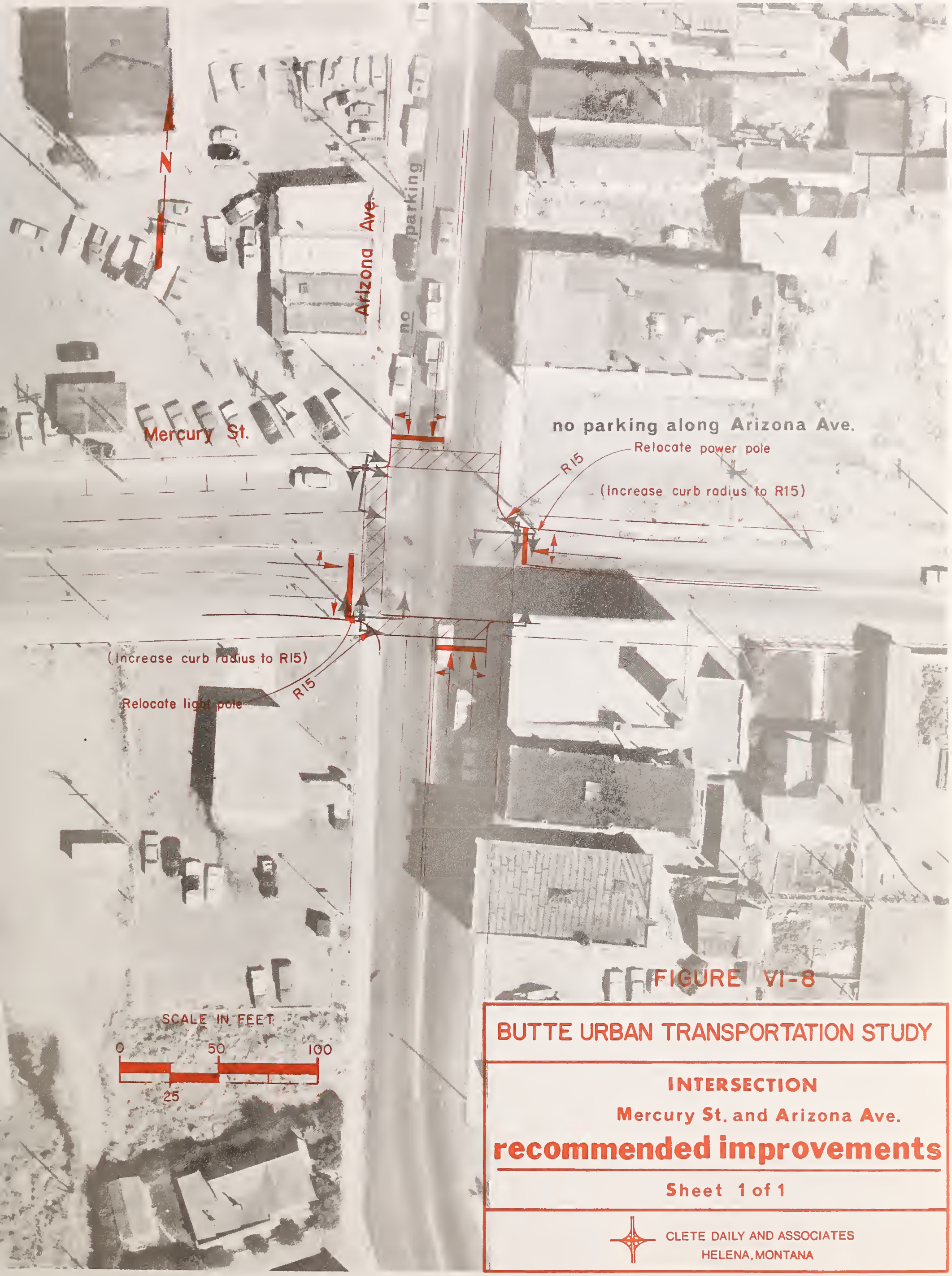


FIGURE VI-8

BUTTE URBAN TRANSPORTATION STUDY

INTERSECTION

Mercury St. and Arizona Ave.

recommended improvements

Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Intersection of Main Street and Mercury Street

Project Number: R5

Problem: The existing traffic signal does not meet the minimum requirements set forth in the Uniform Manual on Traffic Control Devices. Signal visibility is provided by a single, four (4) way, three (3) unit head displaying only one signal face per approach. The Manual calls for a minimum of two signal faces per approach.

The intersection is located in the central business district. Commercial establishments, apartment houses, and off-street parking exist along all approaches. There are no pedestrian signals, marked crosswalks, or vehicle stop bars.

During the three year period, 1969-1971, forty (40) accidents were reported at this location ranking it the second highest accident location in the Butte urban area. Of the forty (40) accidents, thirteen (13) were angle accidents, indicating that signal visibility is insufficient and that sight distance between adjacent approaches is inadequate. Eight (8) accidents involved turning; these are due to vehicular conflicts resulting from inadequate space in the intersection and indecision on the part of the drivers. The latter is caused by poor signal visibility and a lack of signal progression. The eight (8) remaining accidents involved parked cars within thirty (30) feet of the intersection corners.

The intersection of Main Street and Platinum Street is 1,575 feet south of Mercury Street. Vehicles northbound along Main Street progress uphill as they enter the central business district. These two intersections are interconnected, but are not coordinated.

Traffic Data: The Systems Warrant for traffic signals is satisfied because both Mercury Street and Main Street are major urban collectors and the 1971 peak hour intersection approach volume was 1,064 vehicles.

The 1973 average daily traffic on each approach is given below:

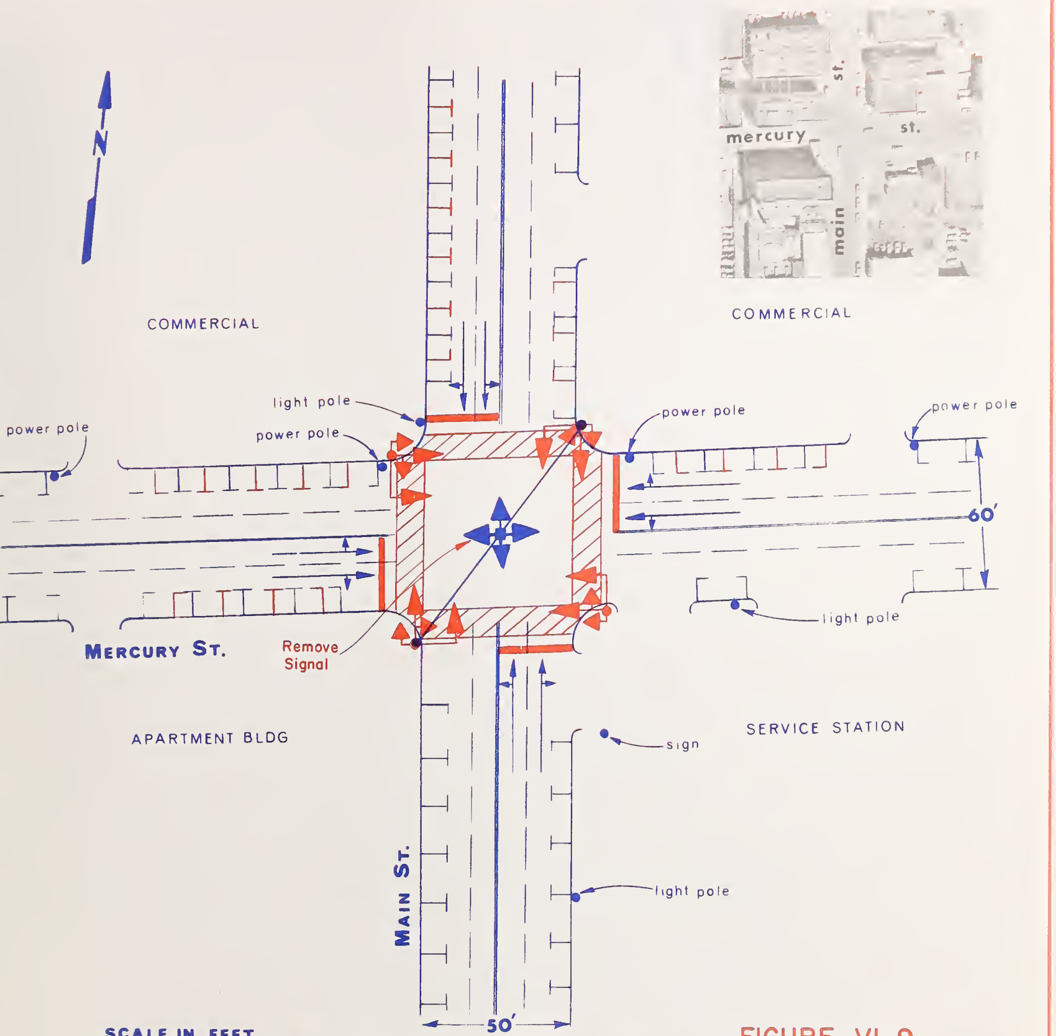
North - 5,210 vehicles per day	East - 5,560 vehicles per day
South - 6,900 vehicles per day	West - 6,840 vehicles per day

Traffic volumes at this intersection are expected to remain fairly stable during the planning period, 1970-1990. Improvements to South Main Street and Kaw Avenue will cause an increase of 2,000 to 3,000 vehicles per day, but most of the increases will be bound to and from zones south of Mercury Street.

Recommended Improvements: (Illustrated in Figure VI-9)

* Replace the existing single dial traffic controller with a three (3) dial controller capable of operating pedestrian signals in conformance with the Uniform Manual of Traffic Control Devices.

* Install pedestrian signals on all four (4) intersection corners.



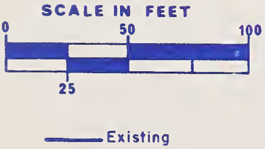


FIGURE VI-9

BUTTE URBAN TRANSPORTATION STUDY

INTERSECTION

Mercury St. and Main St.

recommended improvements

Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

* Remove the existing single head span wire mounted traffic signal. Install mast arms on the far side of each approach to house two (2) - three (3) unit signals.

* Mark crosswalks, vehicle stop lines, and traffic lane lines according to Figure VI-9.

* Coordinate this signal with other existing signals along Main Street - from Platinum Street to Granite Street.

Expected Results: Improvements are primarily aimed at increasing visibility and operational safety. Installation of standard traffic signals, pavement markings, and pedestrian signals should reduce the number of accidents and increase intersection efficiency.

Coordination of this signal with others along Main Street will allow vehicle platoons proceeding uphill to continue past Mercury Street without stopping. Travel speeds will be increased.

Estimated Cost: $15,360

Priority: 1

Intersection of Main Street and Platinum Street

Project Number: R6

Problem: The Uniform Manual on Traffic Control Devices calls for a minimum of two (2) signals per approach at each signalized intersection. This intersection has a single, four (4) way, span wire mounted head that displays only one signal face per approach.

The existing traffic controller is fixed time and has only one (1) dial. Hence, it is not traffic responsive.

Main Street is the major street while Platinum Street is the minor roadway. Of the total vehicles entering the intersection during the peak noon and peak afternoon hours, 72 percent travel on Main Street. Yet the existing signal controller is non-actuated.

A crooked, upright metal beam stands on the southwest corner. It serves no purpose and acts as a "boobytrap" for any vehicle straying across the curb.

Butte High School and Butte Vocational-Technical Center are located one block east of this intersection and one and one-half (1½) blocks north along Wyoming Street. Traffic destined for either school utilizes Arizona Avenue and Main Street as major feeders and Mercury Street and Platinum Street as local streets leading to suitable parking. As a result, Platinum Street is heavily used during special events, such as football games.

Twenty-five accidents were recorded during the three year period 1969-1971. Fifteen (15) occurred at mid-intersection, and the collision types were either angle (11) or turning movement (4). This indicates poor signal visibility, lack of proper signal clearance intervals, and inadequate sight distance at corners.

Traffic Data: Based upon traffic counts conducted in 1971 and 1973, the "Systems Warrant" for traffic signals is satisfied. Both streets are major urban collectors and the peak hour intersection approach volume is 859 vehicles.

Existing and forecast traffic volumes for each approach are given below:

	1973	1990
North	6,190	7,000
South	5,390	9,000
East	3,000	2,410
West	3,330	5,850

Recommended Improvements: (Illustrated in Figure VI-10)

* Replace existing fixed time controller with semi-actuated, two (2) phase controller with three dial coordinating unit and all red clearance capability. Actuate both minor street approaches on Platinum Street with installation of magnetic loop detectors.

* Remove existing span wire mounted signal head. Install mast arms on the far side of each approach to house two (2) - three unit signal heads.

* Pavement markings and pole relocations should be made in accordance with Figure VI-10.

* Coordinate this signal with other Main Street signals to the north.

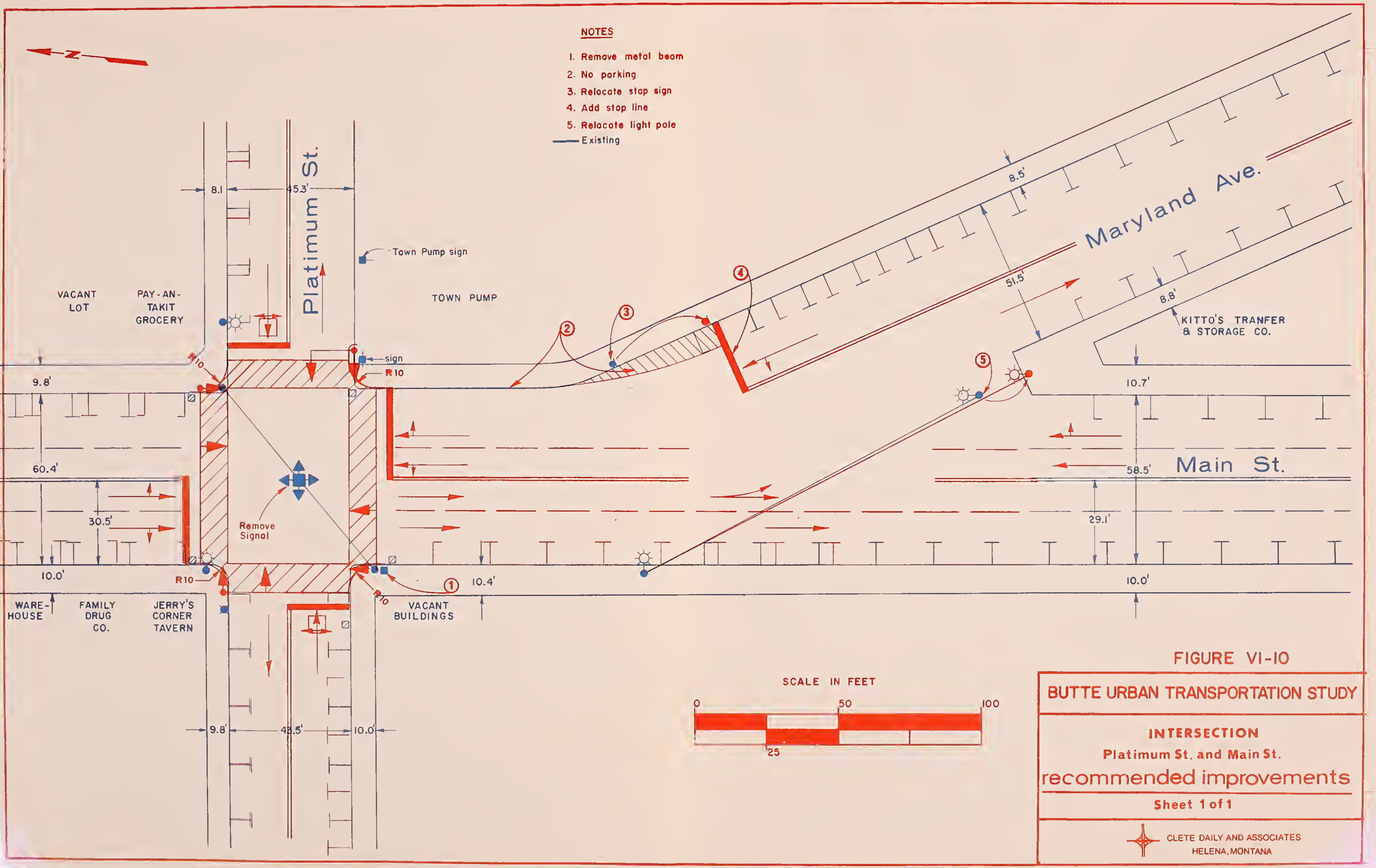
Expected Results: Actuated equipment will allocate green time to Platinum Street only upon demand. Vehicle delay along Main Street will decrease and the average travel speed will increase by about five (5) miles per hour.

Increased number of signal heads will improve signal visibility.

Coordination with signals to the north will further reduce delay along Main Street. Average travel speed will increase and the likelihood of rear end accidents will decrease.

Estimated Cost: $15,360

Priority: 1



NOTES

1. Remove metal beam
2. No parking
3. Relocate stop sign
4. Add stop line
5. Relocate light pole

—— Existing

FIGURE VI-10

BUTTE URBAN TRANSPORTATION STUDY

INTERSECTION
Platimum St. and Main St.
recommended improvements
Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Main Street from Second Street to Front Street

Project Number: R7

Problem: There are three (3) routes available to traffic entering the central business district from the south. They are Montana Street, Main Street, and Arizona/Utah Avenues. Each of these streets have sufficient width to permit four (4) lanes of traffic flow - except for this 800 foot section of Main Street. North of Second Street, the curb to curb width is sixty (60) feet, permitting two parallel parking lanes and four (4) travel lanes. South of Second Street, the width narrows to forty-seven (47) feet, and since curb parking is required for the Evangelical Covenant Church and adjacent commercial uses, only two traffic lanes are available.

Traffic signal visibility is provided by a single, four (4) way head mounted on a diagonal span wire. The signal does not satisfy the requirements of the Uniform Manual of Traffic Control Devices.

Traffic Data: The functional classification of Main Street and Second Street are "urban collector" and "local", respectively. Second Street is not a major route and the intersection does not satisfy the "Systems Warrant". According to traffic counts, the eighth highest hour occurs at 11:00 - 12:00 am. At that time, the Minimum Vehicular Volume Warrant is 63.3 percent satisfied, and the Interruption of Continuous Flow is 51.6 percent satisfied. 1973 and 1990 average daily traffic are shown below:

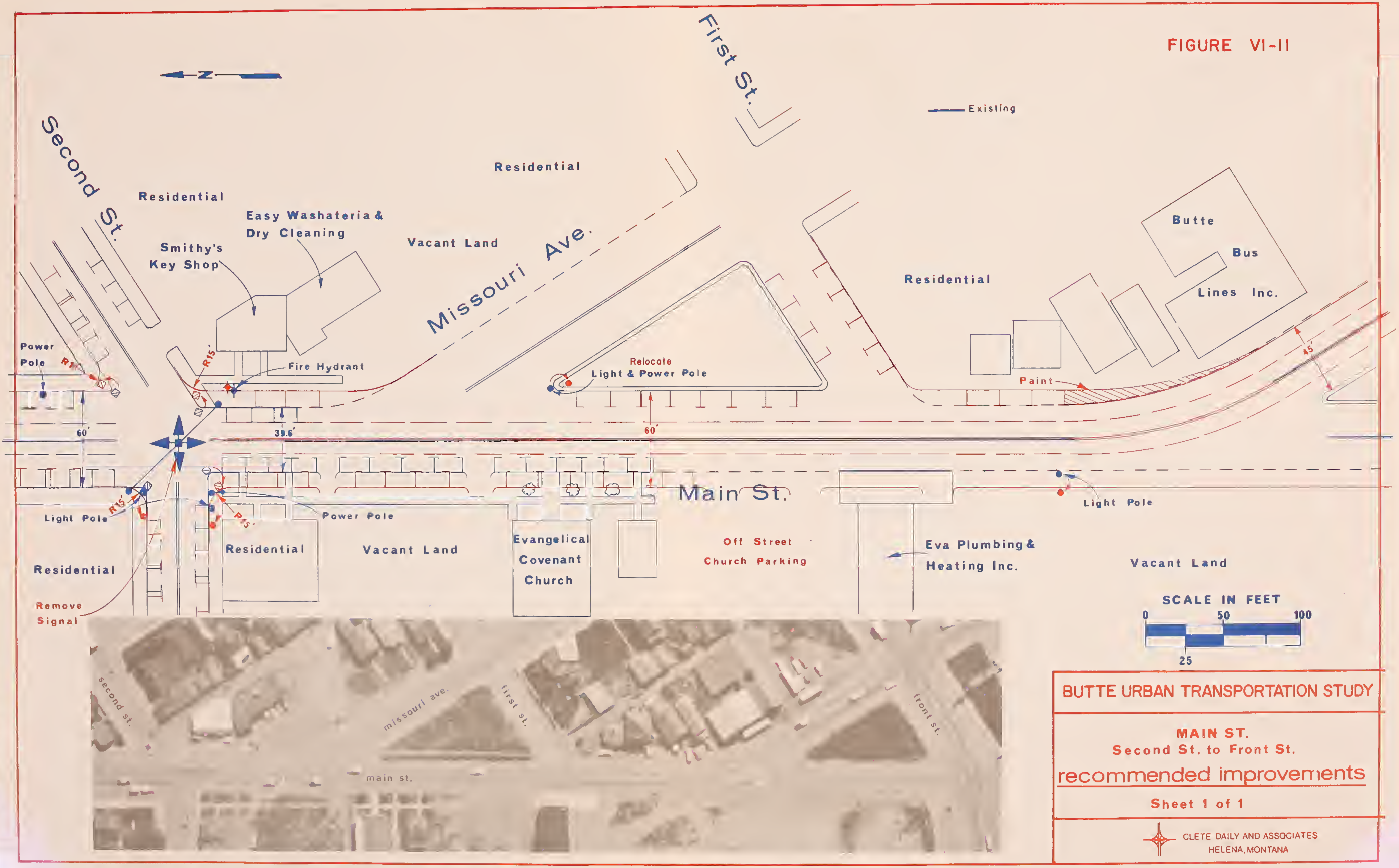
	1973	1990
North	5,390	9,380
South	5,390	10,300
East	3,730	1,420
West	3,230	1,460

Recommended Improvements: (Illustrated in Figure VI-11)

* Widen Main Street from Second Street (extending south) for approximately 800 feet to sixty (60) feet curb to curb. Provide two (2) - eight (8) foot parking lanes and four (4) - eleven (11) foot travel lanes so this section of roadway will be consistent with that north of Second Street.

* Since this traffic signal is substandard, it should either be upgraded to provide a standard semi-actuated, two phase controller or be removed. Main Street is recommended for inclusion on the T.O.P.I.C.S. (Traffic Operations Program to Increase Capacity and Safety) highway system and this improvement is eligible for Federal T.O.P.I.C.S. funding. To receive this funding, signals which do not satisfy the Traffic Signal Warrants must be eliminated. Hence, it is recommended that the existing signal at the intersection of Main Street and Second Street be removed. When the signal is taken out, stop signs should be installed on the Second Street approaches to Main Street.

FIGURE VI-11



BUTTE URBAN TRANSPORTATION STUDY

MAIN ST.
Second St. to Front St.
recommended improvements
Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Expected Results: Main Street improvements are recommended at Second Street, Platinum Street, and Mercury Street. The purpose is to eliminate bottlenecks along this corridor so that speeds can be increased. Main Street will then be a more attractive route to travel and attract some traffic from Montana Street and Arizona/Utah Avenues. Improvements near Second Street will serve this purpose by decreasing delay and providing free traffic flow.

Estimated Cost: $20,950

Priority: 1

Harrison Avenue between Front Street and Olympia Street

Project Number: R8

Problem: This section of Harrison Avenue is 1,100 feet in length. There are a total of fifteen (15) driveways that serve Albertson's Shopping Center, the Civic Center, temporary parking across from the Civic Center, and various commercial establishments. Measurement along the arterial centerline gives an average spacing of seventy-four (74) feet between entrances. All of the driveways operate as two-way with no restrictions on turning movements. There are no traffic signals to provide a transfer of right of way to individual traffic movements. The result is unordered traffic flow, congestion, and indecision by motorists.

The curb to curb width is sixty-eight (68) feet. This is wide enough to permit four (4) traffic lanes and a left turn bay. A separate turn bay is provided and marked with paint. However, the paint wears off quickly, and during the winter months, it is not visible. In both cases, motorists are not certain of the existence or the boundaries of the turn bay.

Traffic flow along Harrison Avenue is summarized in Table VI-5. Assuming Harrison Avenue to be the major street and the exits from Albertson's to be the minor approach, volumes are greater than 900 and 75 vehicles per hour, respectively. Requirements for the traffic signal warrant, "Interruption of Continuous Flow" are fulfilled for at least seven (7) hours of the day. Since the volumes are high, it appears that the warrant would be satisified for one (1) additional hour.

The vehicles exiting from Albertson's use any one (1) of four (4) driveways, none of which will meet the requirements of the signal warrant individually.

Table VI-5

HARRISON AVENUE TRAFFIC FLOW

FRONT STREET TO OLYMPIA STREET

	Harrison Avenue Between Front Street and Grand Street			Number Pedestrians Crossing Harrison Avenue	Number Vehicles Exiting		
Hour	N.Bnd	S.Bnd	Total		Albertson's	Corral Street	Civic Center
7-8	520	196	716	NA	NA	NA	NA
8-9	489	324	813	NA	NA	NA	NA
11-12	479	548	1027	5	121	29	28
12-1	727	750	1477	3	165	17	18
1-2	726	704	1430	NA	160	NA	NA
2-3	689	756	1445	NA	157	20	NA
3-4	666	794	1460	NA	170	NA	NA
4-5	641	841	1482	0	199	13	27
5-6	467	905	1372	0*	115*	7*	NA

* Time Period: 5:00 - 5:30 p.m.

NA: Not Available

The Civic Center is a major traffic generator. Usage is random and peak vehicle exits occur over a very short period of time. In 1972, 84,500 people attended regularly scheduled events at the Civic Center. The Center personnel estimated an additional 2,500 persons using the facilities for unscheduled events such as basketball and skating practice. Based on data supplied by the Center, it is estimated there were forty-six (46) events during which there were enough vehicles to warrant a traffic signal. Most of these events occur during the evening, and the signal would be warranted for one hour when the event ended. Basketball tournaments are an exception because games are played in the morning, afternoon and evening. Using these assumptions, there were a maximum of 109 hours during the year when the traffic signal warrant was satisfied.

There are two (2) exits to Harrison Avenue that serve the Civic Center. A traffic signal has recently been installed between these exits directly in front of the Center. It serves primarily as a pedestrian signal during schedules events as it is not properly located to control traffic turning onto Harrison Avenue. The signal does not serve traffic exiting Albertson's.

Capacity: This roadway section operates as two (2) lanes of traffic in each direction with no parking. The peak hour volume is 1,482 vehicles per hour or 641 vehicles per hour northbound and 841 vehicles per hour southbound. With left turns negotiated from the inside through lane, the service volume at Level C per direction is 1,930 vehicles per hour of green time. The resulting demand volume to service volume ratio is 0.33 and 0.43 for northbound and southbound traffic, respectively. Since the ratio is considerably below 1.00, adequate service is available throughout this section.

Accidents: The records examined indicate that most accidents are occurring at signalized intersections on Harrison Avenue. Accidents do not appear to be a serious problem along this section of Harrison Avenue.

Recommended Improvements: (Illustrated in Figure VI-12)

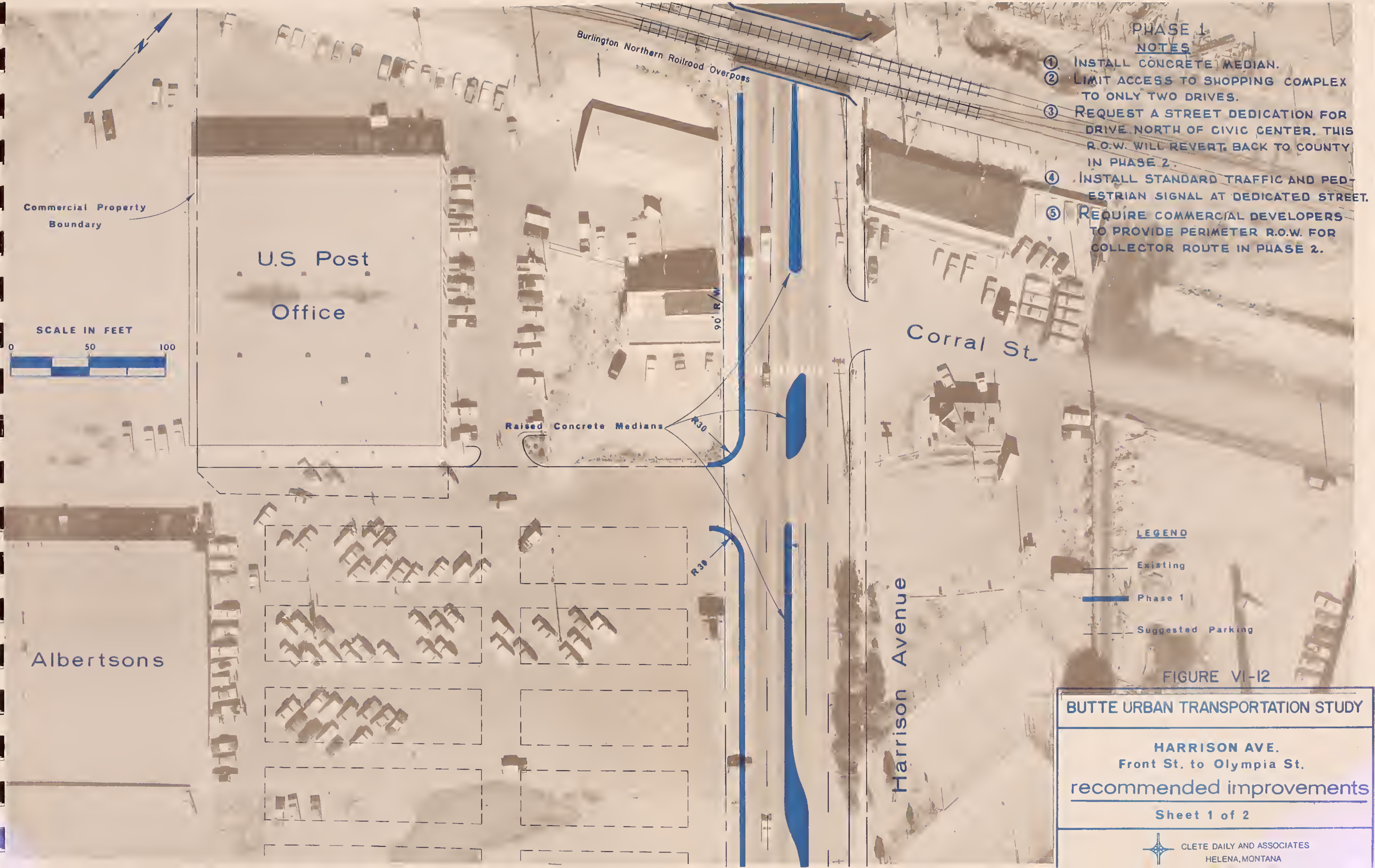
Improvements are divided into Phase 1 and Phase 2. The purpose of Phase 1 is to improve traffic and pedestrian flow by providing limited access and a standard traffic signal. Phase 1 should be implemented immediately. Phase 2 should be undertaken when commercial expansion adjacent to Albertson's becomes a reality. Recommendations are summarized for each phase.

Phase 1 -

* The curb to curb width is sixty-eight (68) feet. It is recommended that four (4) travel lanes be maintained using fifty-two (52) feet. The remaining sixteen (16) feet are to be used for a raised concrete median. A left turn bay of twelve (12) feet should be constructed at designated locations within the median.

* Close three (3) of the entrance/exit driveways to Albertson's by extending the barrier curb. Retain the northern most driveway for access to and from the U.S. Post Office. Provide a second (new) access driveway to the shopping center directly opposite the existing roadway located north of the Civic Center. Request that the Silver Bow County Commissioners designate this north roadway to be a dedicated street, followed by installation of a standard semi-and-pedestrian-actuated traffic signal. Coordinate with signals at Utan Avenue and Grand Avenue. Remove the existing fixed time traffic signal in front of the Civic Center. The street dedication at the north drive should be temporary as it is recommended that the signal and street dedication be moved to the drive south of the Civic Center in Phase 2.

* Commercial expansion adjacent to Albertson's is presently contemplated. A development plan should be required which details parking lot location, internal traffic circulation, and access to/from the street system. Figure VI-12 shows a proposed plan which would provide perimeter traffic circulation. Pedestrian activity would be concentrated and vehicle/pedestrian conflicts minimized. The City - County Planning Board should require the developer to provide right of way for a perimeter route in the approximate location shown by Figure VI-12. The exact location of this street may vary; however, it should intersect Harrison Avenue at the intersection of the proposed collector route (recommended for construction during Phase 2) located south of the Civic Center. Agreement on this right of way should be obtained prior to approval of building permits.



PHASE 1

NOTES

① INSTALL CONCRETE MEDIAN.

② LIMIT ACCESS TO SHOPPING COMPLEX TO ONLY TWO DRIVES.

③ REQUEST A STREET DEDICATION FOR DRIVE NORTH OF CIVIC CENTER. THIS R.O.W. WILL REVERT BACK TO COUNTY IN PHASE 2.

④ INSTALL STANDARD TRAFFIC AND PEDESTRIAN SIGNAL AT DEDICATED STREET.

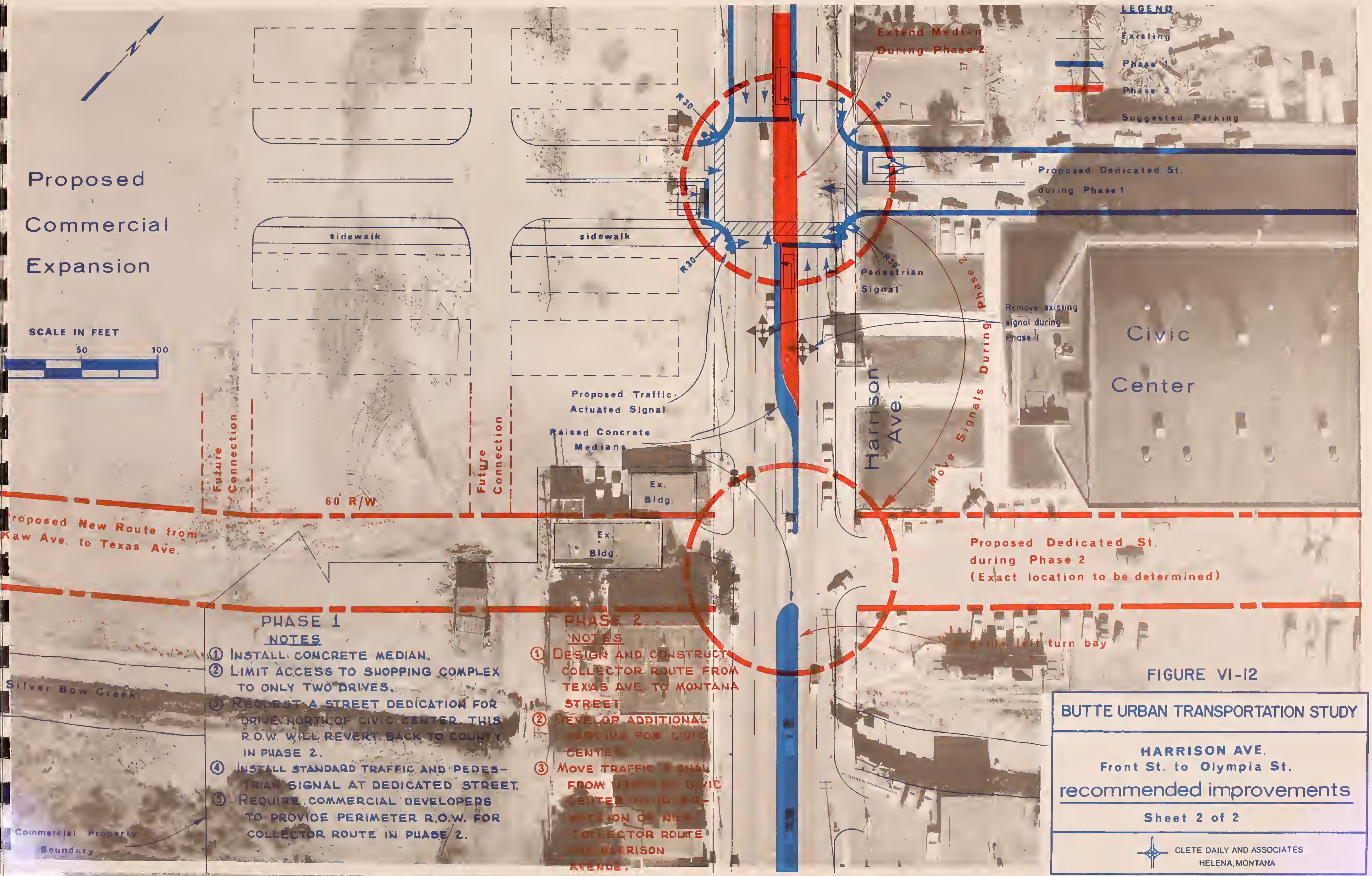
⑤ REQUIRE COMMERCIAL DEVELOPERS TO PROVIDE PERIMETER R.O.W. FOR COLLECTOR ROUTE IN PHASE 2.

FIGURE VI-12

BUTTE URBAN TRANSPORTATION STUDY

HARRISON AVE.
Front St. to Olympia St.
recommended improvements
Sheet 1 of 2

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA



PHASE 1

NOTES

① INSTALL CONCRETE MEDIAN.
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④ INSTALL STANDARD TRAFFIC AND PEDESTRIAN SIGNAL AT DEDICATED STREET.
⑤ REQUIRE COMMERCIAL DEVELOPERS TO PROVIDE PERIMETER R.O.W. FOR COLLECTOR ROUTE IN PHASE 2.

PHASE 2

NOTES

① DESIGN AND CONSTRUCT COLLECTOR ROUTE FROM TEXAS AVE. TO MONTANA STREET.
② DEVELOP ADDITIONAL PARKING FOR CIVIC CENTER.
③ MOVE TRAFFIC SIGNAL FROM NORTH OF CIVIC CENTER TO INTERSECTION OF NEW COLLECTOR ROUTE AND HARRISON AVENUE.

FIGURE VI-12

BUTTE URBAN TRANSPORTATION STUDY

HARRISON AVE.
Front St. to Olympia St.
recommended improvements
Sheet 2 of 2

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Phase 2 -

* A collector route extending from Texas Avenue to Kaw Avenue intersecting Harrison Avenue and passing south of the Civic Center, should be designed and constructed.

* Commercial expansion south of Albertson's will be open for business during evenings thus closing this parking to Civic Center use. The County Commissioners should develop additional parking east and north of the Center. If the City Corral is moved (as presently being discussed), that site should be investigated for future parking.

* Move the traffic signal (installed during Phase 1 just north of the Civic Center) to the new collector route south of the Center. Extend the Harrison Avenue raised median to prevent left turn access at the drive north of the Civic Center.

Expected Results: Installation of the raised concrete median will provide designated access locations. The random turning that is now prevalent will be minimized. The raised median will also provide a clear indication to motorists as to where the separate bay is located. By separating the left turn movements from through traffic, the service volume per direction per hour of green time will increase from 1,930 vehicles to 2,200 vehicles. This represents a 14 percent gain.

The designated crosswalk with both pedestrian and traffic signals will concentrate pedestrian activity during Civic Center events, eliminate confusion, and increase pedestrian safety.

Phase 2 improvements are intended to serve longer range goals than Phase 1. The Civic Center will need new parking with the advent of commercial expansion. The expanded commercial activities will require perimeter traffic access. These needs will be met by the new collector route, located south of the Civic Center.

Estimated Cost: $44,390

Priority: 1

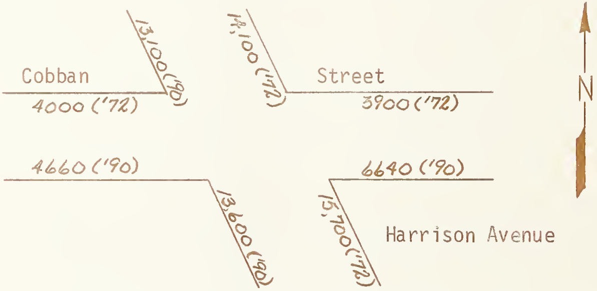
Intersection of Harrison Avenue and Cobban Street and Cobban Street from Harrison Avenue to Florence Avenue

Project Number: R9

Problem: Harrison Avenue at Cobban Street is seventy (70) feet curb to curb. There are four travel lanes with parallel parking on each side of both approaches. Separate left turn bays for turning off Harrison Avenue onto Cobban Street are not available. Parking is permitted within ten (10) feet of the corners; visibility between adjacent approaches is restricted causing a hazardous pedestrian crossing.

Cobban Street is functionally classified as an urban collector. It serves the expanding residential areas between Continental Drive and Kaw Avenue. The curb to curb width between Harrison Avenue and Florence Avenue is thirty-four (34) feet; this is restrictive and reduces the average twenty-four (24) hour travel speed to 12.9 miles per hour. The approaches to Harrison Avenue are offset by forty (40) feet and necessitate a jog when traversing across Harrison Avenue. One approach lane must accommodate all turning movements from Cobban Street onto Harrison Avenue.

Traffic Data: The schematic diagram below shows that the traffic volumes along Cobban Street on both sides of Harrison Avenue are expected to increase through the planning period.



Traffic volumes along Harrison Avenue are expected to decrease slightly; this is due to a shift of development southward toward the "flats", construction of the proposed western beltway that connects the Montana corridor, and improvements along Main Street. However, Harrison Avenue will continue to carry a major portion of the traffic destined for areas south of IR15-90.

The intersection of Harrison Avenue and Cobban Street is signalized with a semi-actuated signal. The Minimum Vehicular Volume Warrant and the Systems Warrant are satisfied. All approaches have adequate capacity and do not require widening on account of demand. However, because Cobban Street jogs across Harrison Avenue, the movement is difficult and vehicular conflicts are apparent. Accident data supports this evaluation.

Accidents: Thirty-six (36) accidents were reported during 1969-1971. This was the fourth highest accident location in the Butte urban area. Twelve (12), or 33 percent of the accidents were of the rear-end type; and eleven (11) of them occurred on the southbound approach to Cobban Street. The rear-end accidents were randomly scattered throughout the day with half occurring after dark. Cause of the accidents is attributed to poor signal head visibility (prior to 1971 there was only one signal face per approach), poor sight distance between adjacent approaches, and the lack of a separate left turn bay on Harrison Avenue. The Federal 9999 project, completed at the end of 1970, up-dated the signal and provided adequate signal visibility. However, three (3) rear-end accidents were reported on southbound Harrison Avenue during 1971; they all occurred after dark indicating that a stopped vehicle in a through lane was waiting to make a left turn.

Nineteen (19), or 53 percent of the accidents occurred at mid-intersection. The collision types were either angle or turning movement indicating poor visibility, conflict of movements, and indecision by motorists.

Signal visibility has been improved. Further improvements should open up the intersection and provide free flow. Elimination of the jog along Cobban Street is desirable; however, additional right of way including at least one house would be required. This is not justified.

Recommended Improvements: (Illustrated in Figure VI-13)

* Eliminate twelve (12) parallel parking spaces along the east side of Harrison Avenue so that additional width can be obtained for installation of two (2) separate left turn bays. These bays can be of minimum length (i.e. sixty (60) feet) because the number of left turning vehicles will not increase substantially by 1990. Eliminate parking behind each crosswalk in accordance with Figure VI-13, and increase curb radii to fifteen (15) feet. Cobban Street, between Harrison Avenue and Florence Avenue should be widened by twelve (12) feet to a curb to curb width of forty-six (46) feet. A four (4) foot boulevard will remain on the north side of the street. Both approaches to Harrison Avenue should be widened to two (2) lanes - one for left turns and the other for right turns and through movements.

* Cobban Street is an east-west collector street that feeds the Main Street-Kaw Avenue corridor. In addition to the signal at Harrison Avenue, eight (8) stops are required as a motorist proceeds from Continental Drive to Main Street. Travel time to Main Street and the uptown could be decreased by removal of six (6) of the Cobban Street stops located at Lafayette Avenue, Garfield Avenue, Massachusetts Avenue, Texas/Florence Avenues, Lowell Avenue and Oregon Avenue. Sidewalks should be provided for students. Channelization is recommended at the five-way intersection of Cobban Street-Florence Avenue - Texas Avenue to help allevaite confusion.

Expected Results: The quality of traffic flow through these intersections will be improved. Three criteria should be observed to evaluate this anticipated improvement. Accident records should be monitored and compared with those described on the previous pages. The average travel speeds along Cobban Street between Harrison Avenue and Florence Avenue are expected to increase from 12.9 miles per hour to 16.7 miles per hour. This effect can be measured after implementation of the recommended improvements. The third indication must rely on judgement. Presently the traffic flow across Harrison Avenue on Cobban Street is restricted due to narrow widths and the intersection offset. The proposed improvements are intended to open up the intersection and provide less restricted and safer flow. A comparison can be made by observing future accidents and measuring travel speeds, but overall improvements must be observed through use of the facility.

Estimated Cost: $17,900

Priority: 1

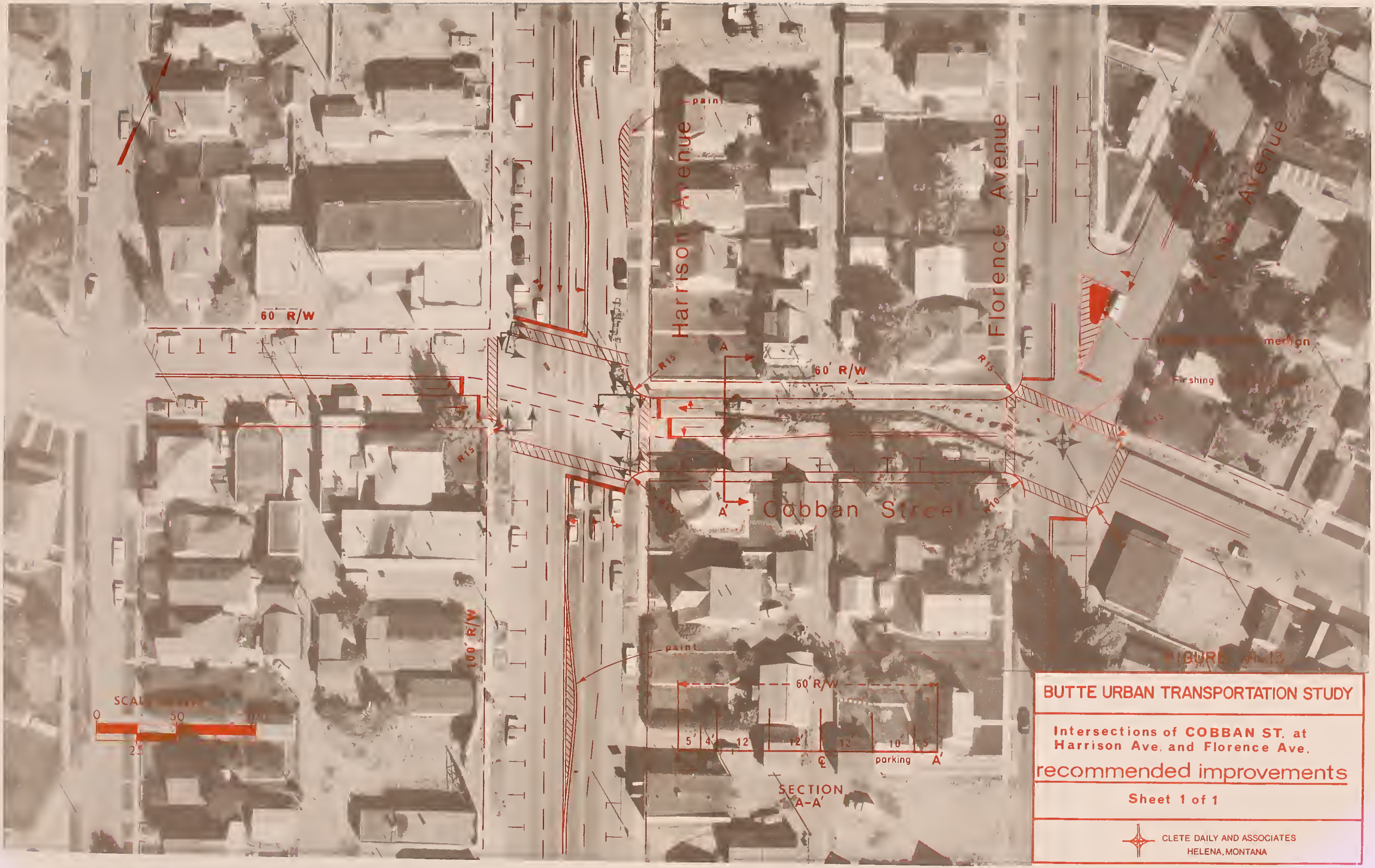


FIGURE IV-13

BUTTE URBAN TRANSPORTATION STUDY

Intersections of COBBAN ST. at Harrison Ave. and Florence Ave.

recommended improvements

Sheet 1 of 1

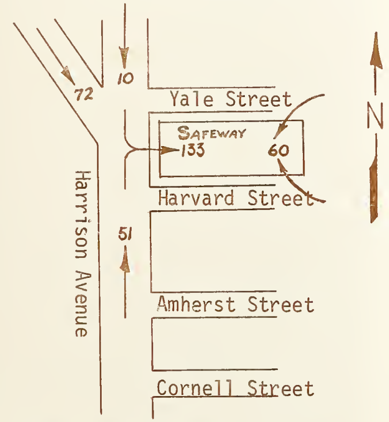
CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Harrison Avenue from Yale Avenue to Cornell Avenue

Project Number: R10

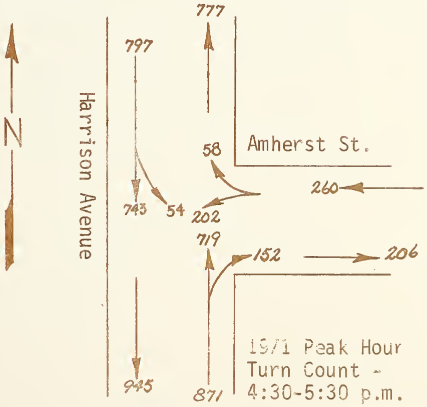
Problem: Harrison Avenue from Yale Avenue to the Plaza Shopping Center is presently one of the heaviest traveled sections of highway in the Butte urban area. Traffic counts in 1973 indicate volumes over 17,000 vehicles per day. Traffic is expected to increase. With continued development according to the adopted land use plan, volumes will reach 24,000 vehicles per day by 1990.

Southbound left turn movements from Harrison Avenue to Yale Avenue, Harvard Avenue, Amherst Avenue and Cornell Avenue must be negotiated from the inside trhough traffic lane. A separate left turn bay is not provided. Left turns to Yale Avenue and Harvard Avenue are heavy because of the Safeway Shopping Center located east of Harrison Avenue. The Shopping Center has 26,600 square feet of floor space and attracts 193 trips during the afternoon peak shopping hour. The distribution of these trips is shown at the left. The left turn movements must be made from a through lane and against opposing volumes of 780 vehicles per hour.



Safeway Weekday Peak Hour Trip Attraction

Turn movement counts were conducted at the intersection of Harrison Avenue and Amherst Avenue in June, 1971. The p.m. peak hour was 54 southbound left turn vehicles to Amherst Street, while the opposing traffic was 720 vehicles. This number of left turns is only 6.7 percent of the approach volume; however, a separate turn bay does not exist and because of the high opposing traffic, many motorists must stop and wait for the clearance interval. Turn counts are shown below:



1971 Peak Hour Turn Count - 4:30-5:30 p.m.

Cornell Avenue is located only 150 feet south of Amherst Avenue. Vehicles approaching Harrison Avenue along Cornell Avenue are faced with heavy traffic from both directions and a queue of vehicles due to the traffic signal at Amherst Avenue. Left turns are permitted off Harrison Avenue to Cornell Avenue. They also must be made from a through traffic lane.

Congestion will continue to increase at the intersection of Harrison Avenue and Cornell Avenue due to the recent construction of the War

Bonnet Inn located on Cornell Avenue about 600 feet east of Harrison Avenue. This facility has 110 motel units and employs 50 people. Because of the limited space at the Harrison Avenue - Cornell Avenue intersection, Cornell Avenue should be converted to one-way, eastbound operation between Harrison Avenue and the entrance to the Motel.

Capacity: The demand volume to service volume ratio at Level of Service C was calculated for each approach at the signalized intersection of Harrison Avenue and Amherst Avenue. The results are given below:

Street	Direction	Ratio DV:SV/c
Harrison Avenue	Northbound	0.89
Harrison Avenue	Southbound	0.75
Amherst Avenue	Westbound	0.93

Northbound Harrison Avenue and westbound Amherst Avenue are approaching the citical value of 1.00, the point where the demand volume becomes greater than the service volume and the service rendered drops to Level D. With a modest traffic growth of 3 percent per year, the westbound and northbound approaches will achieve ratios equal to or greater than 1.00 in 3 and 4 years, respectively. The turning counts were conducted in 1971, so deficiencies are expected by 1974-1975.

Accidents: Accident data for the Butte area were collected for the three year period, 1969-1971. Table II-4 summarizes accident data for the twenty-three (23) highest locations in the study area. None of the intersections within this roadway section are included. It is concluded that even though traffic conflicts exist, motorists have adjusted to the delays and inefficiencies and have avoided accidents in this location.

Recommended Improvements: (Illustrated in Figure VI-14)

* Shift Harrison Avenue traffic adjacent to the curb on the west side of the street so that a separate left turn bay can be added. The left turn lane should provide for southbound turns to Harvard Avenue and Amherst Avenue. Since commercial activity prevails along the west side of Harrison Avenue, pedestrians should be protected. The sidewalk should be set back to within one (1) foot of the right of way line.

* Update the existing traffic signal at the intersection of Harrison Avenue and Amherst Avenue to include an actuated advance green arrow for southbound left turns.

* Increased capacity will soon be required along the Amherst Avenue approach to Harrison Avenue. Reconstruct this approach to provide both a left and a right turn lane.

* Extend the existing raised concrete median from south of Cornell Avenue to Amherst Avenue.

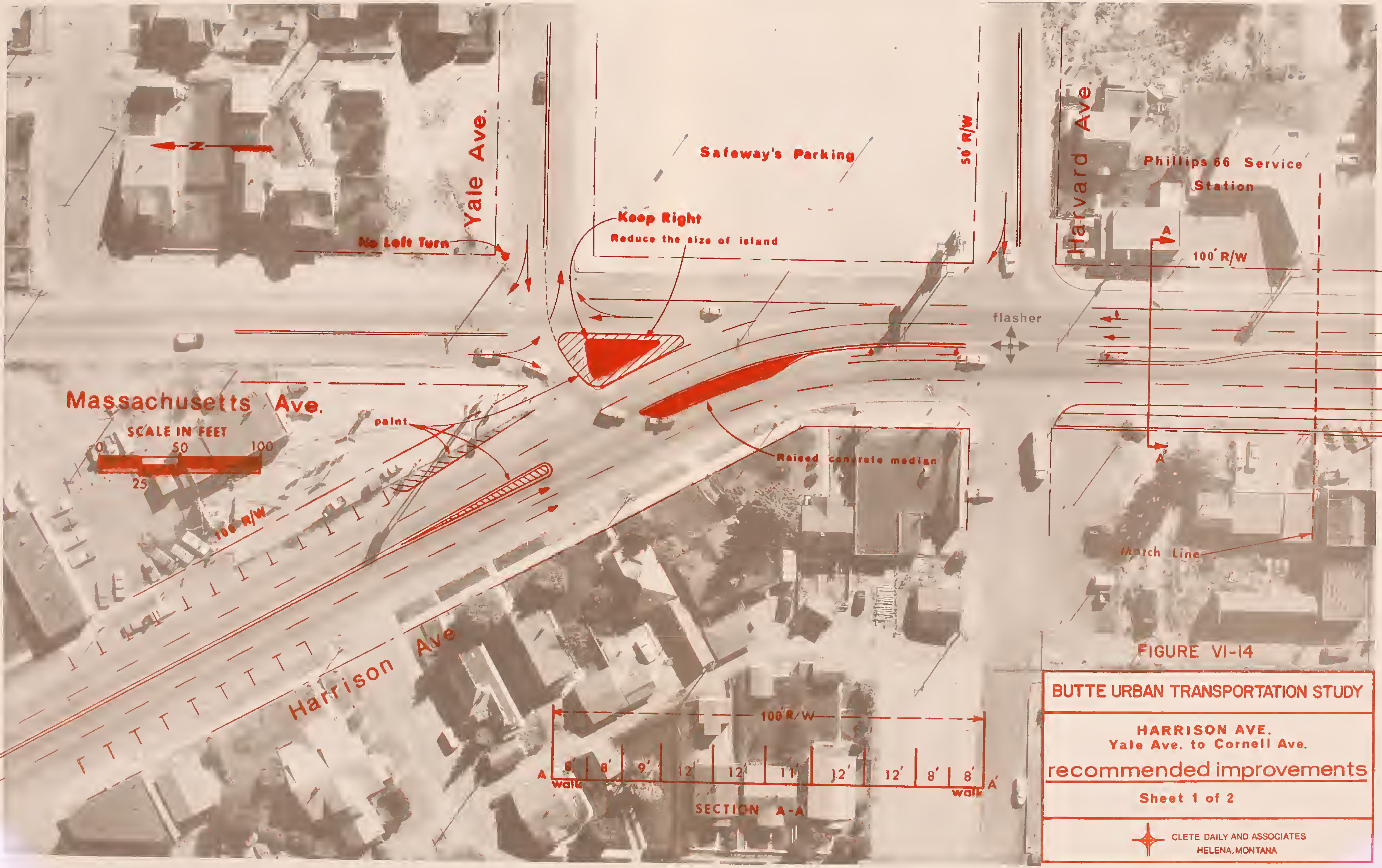


FIGURE VI-14

BUTTE URBAN TRANSPORTATION STUDY

HARRISON AVE.
Yale Ave. to Cornell Ave.

recommended improvements

Sheet 1 of 2

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

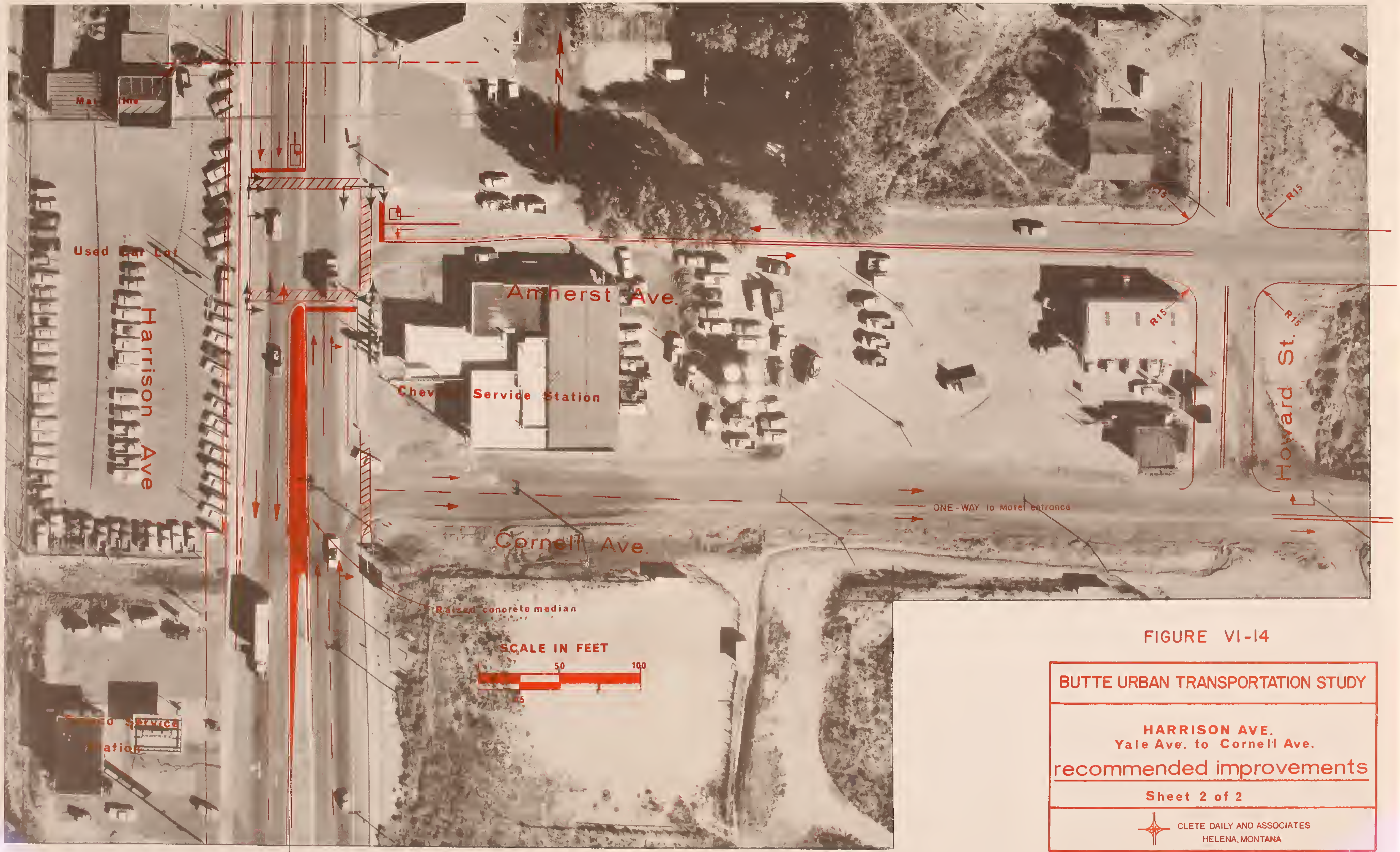


FIGURE VI-14

BUTTE URBAN TRANSPORTATION STUDY

HARRISON AVE.
Yale Ave. to Cornell Ave.

recommended improvements

Sheet 2 of 2

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

* Convert Cornell Avenue to one-way eastbound for a distance of 500 feet, extending from Harrison Avenue to the War Bonnet Inn entrance.

Expected Results: A number of traffic conflicts exist due to negotiation of left turns from a through southbound traffic lane to Yale, Harvard, Amherst, and Cornell Avenues.

The short distance between Amherst Avenue and Cornell Avenue (150 feet), cause northbound vehicles stopped at the Amherst signal to be in conflict with southbound vehicles attempting left turns to Cornell Avenue. The above recommendations are expected to reduce these conflicts.

Installation of the additional approach lane on Amherst Avenue will double the capacity and reduce the demand to service volume ratio (at Level of Service C) from 0.93 to 0.54.

Conversion of a portion of Cornell Avenue to one-way eastbound operation will require vehicles exiting the War Bonnet Inn to use Amherst Avenue and thus eliminate turning conflicts at the intersection of Harrison Avenue and Cornell Avenue.

Estimated Cost: $21,150

Priority: 1

Intersection of Harrison Avenue and Dewey Boulevard

Project Number: R11

Problem: The northbound left turn movement was examined, and it was determined that the service volume is 50 vehicles per hour. The 1971 peak hour demand was 68 vehicles, giving a demand volume to service volume ratio of 1.36. Since the ratio is greater than 1.00, a deficiency exists. This correlates with the field observation that some motorists desiring to turn left must negotiate the left turn during a clearance interval. Considerable delay results if a vehicle does not activate the Dewey Boulevard approach to cause a transfer of signal control.

There is less than 100 feet between the IR15-90 eastbound off ramp to Harrison Avenue and Dewey Boulevard. Vehicles approaching Harrison Avenue on this ramp are traveling 25 to 30 miles per hour, which requires a minimum visibility prior to the stop bar of from 175 to 250 feet. When a motorist turns right onto Harrison Avenue he is faced with a traffic signal and about sixty (60) feet to the stop bar. When other vehicles are queued due to a red signal indication, the stopping sight distance is less than 60 feet.

Traffic Data: Dewey Boulevard is an urban collector and Harrison Avenue is a primary arterial. Both qualify as major routes, and the 1971 peak hour intersection approach volume was 1,887 vehicles. Hence, the "Systems Warrant" for traffic signals is satisfied.

Average daily traffic for 1973 and 1990 are tabulated below:

	1973	1990
North	19,000	24,600
South	15,550	24,600
East	3,580	4,780

This intersection is signalized and operates in semi-actuated, two phase mode. Green time is allocated to Dewey Boulevard only upon demand. At all other times the green time remains with the major movements on Harrison Avenue.

Accidents: Accident collision diagrams were examined for the three (3) year period 1969-1971. Sixteen (16) accidents were reported for this intersection.

Table II-4 indicates that seven (7) of these accidents involved rear-end collisions, all of which occurred along Harrison Avenue. Five (5) additional accidents involved left turning vehicles proceeding from northbound Harrison Avenue to westbound Dewey Boulevard. The remaining four (4) reported accidents were of random types.

Recommended Improvements: (Illustrated in Figure VI-15)

* Install an actuated, advance left turn green arrow on the Harrison Avenue northbound approach. This separate green arrow will function as a portion of "A" phase which presently controls movements on Harrison Avenue.

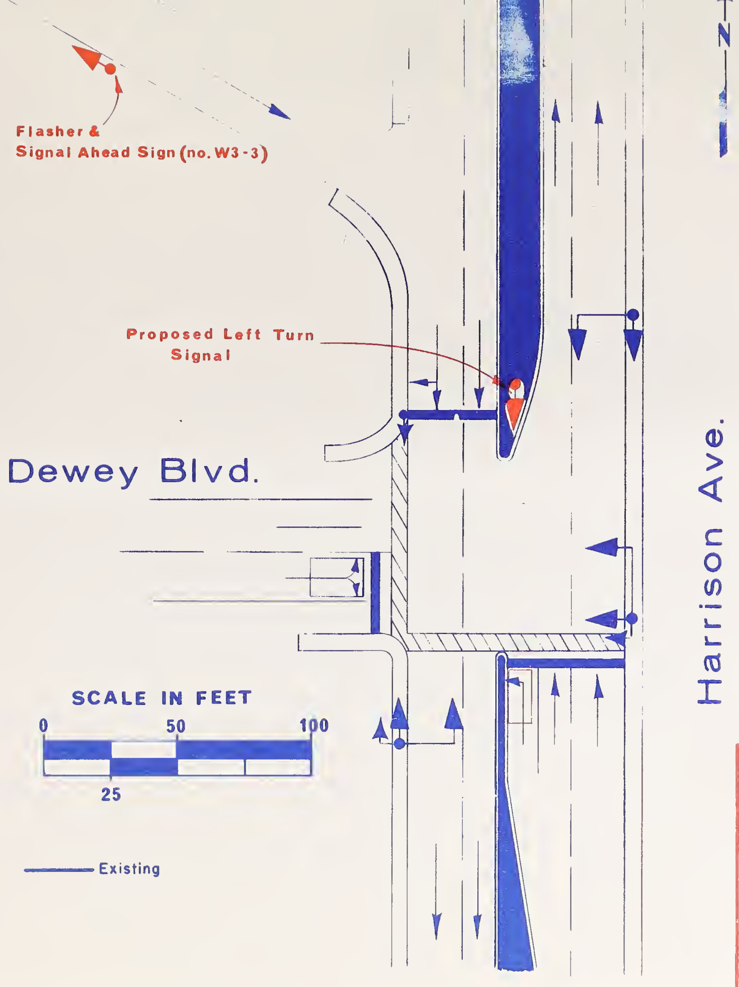
* Install a flashing yellow beacon and a Signal Ahead Sign (Number W3-3 in Uniform Manual of Traffic Control Devices) on the eastbound off-ramp approach to Harrison Avenue to warn motorists of the upcoming traffic signal at Dewey Boulevard.

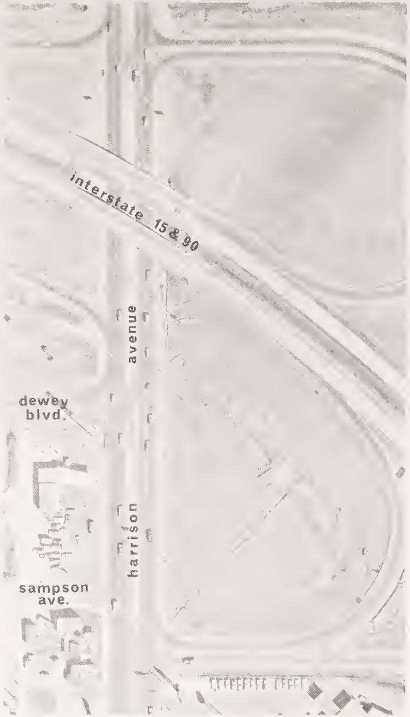
Expected Results: Installation of the actuated northbound left turn arrow will eliminate the conflict resulting from motorists attempting left turns between inadequate gaps in the opposing traffic and during clearance intervals.

Regular users of the IR15-90 off-ramp are accustomed to operational shortcomings, such as the lack of signal sight distance when turning onto Harrison Avenue. Installation of the flashing beacon and a Signal Ahead Sign on the off-ramp approach will provide advance warning to out-of-town motorists that a signal indication is ahead.

Estimated Cost: $1,400

Priority: 1





BUTTE URBAN TRANSPORTATION STUDY

Intersection of
HARRISON AVE. and Dewey Blvd.

recommended improvements

Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

FIGURE VI-15

Intersection of Continental Drive and Texas Avenue

Project Number: R12

Problem: A wide open triangular zone covering approximately 8,400 square feet is available for turning between Continental Drive and Texas Avenue. There is no channelization to direct traffic, nor are there pavement markings to give direction to motorists. The result is indecision and confusion by drivers.

A similar situation exists 300 feet south of Continental Drive where Texas Avenue joins the Civic Center service road. The latter is used by the public as a short cut to Harrison Avenue. The zone of transition for turning movements covers 6,300 square feet and there is no channelization or pavement markings. These two intersections are shown in Figure VI-16.

Traffic Data: Average daily traffic for 1973 and 1990 are tabulated below:

	Two Way Traffic	
Location	1973	1990
East	8,000 vehicles per day	11,000 vehicles per day
West	6,150 vehicles per day	9,500 vehicles per day
South	3,000 vehicles per day	4,000 vehicles per day

Traffic is expected to increase throughout the planning period, and the sererity of traffic conflicts will become more accute.

Recommended Improvements: (Illustrated in Figure VI-16)

* Construct raised concrete medians to channelize traffic flow.

* Update signing and pavement markings to correspond with the 1971 edition of the Uniform Manual of Traffic Control Devices.

* Provide standard information to direct Civic Center traffic.

Expected Results: Channelization will reduce traffic conflicts increasing safety at these intersections.

Estimated Cost: $7,250

Priority: 2

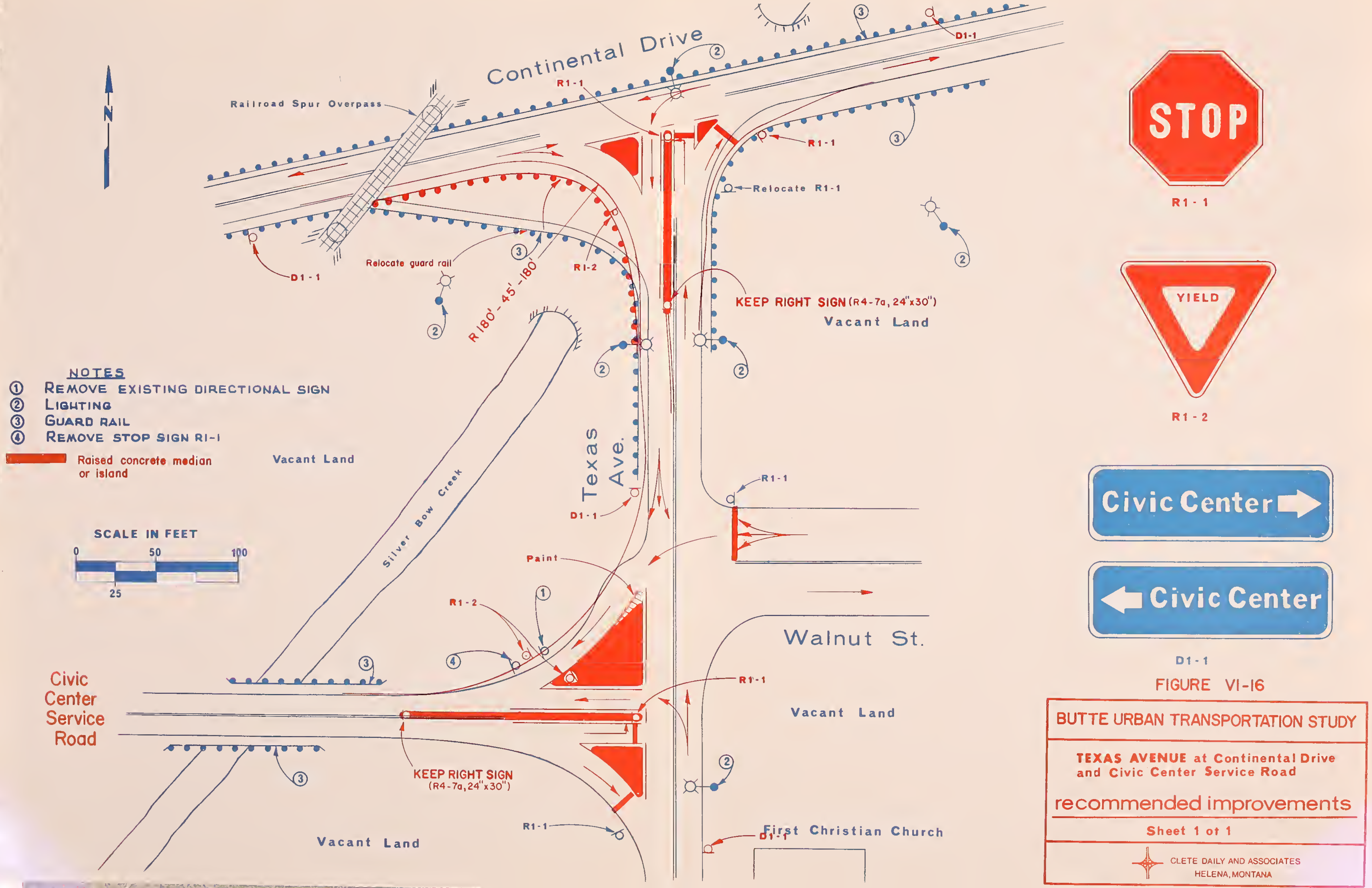


FIGURE VI-16

BUTTE URBAN TRANSPORTATION STUDY

TEXAS AVENUE at Continental Drive and Civic Center Service Road

recommended improvements

Sheet 1 of 1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Civic Center Collector Route Between Harrison Avenue and Texas Avenue

Project Number: R13

Problem: The general public presently uses the Civic Center property as an east-west collector route between Harrison Avenue and Texas Avenue and to Continental Drive. Civic Center personnel estimate travel at about 1,500 vehicles per day.

Alternate testing of future highway networks identified a need for an east-west collector street extending from Kaw Avenue to Texas Avenue and passing adjacent to the Civic Center. A section of the street to the west of Harrison Avenue requires new construction and is discussed in the next section (see page VI-56). The section from Harrison Avenue to Texas Avenue requires street dedication, reconstruction to provide proper alignment, pavement marking and signing.

This improvement must be coordinated with Harrison Avenue recommended improvements between Front Street and Olympia Street (see Figure VI-12). During Phase 1, street dedication, pavement marking and signing will be sufficient to route traffic north of the Civic Center. Reconstruction to provide a permanent route and to direct traffic south of the Center should be undertaken during Phase 2.

Estimated Cost: $154,800

Priority: 3

Lowell Avenue from Montana Department of Highways to Proposed Western Beltway:

Project Number: R14

Problem: Lowell Avenue is a two (2) lane roadway extending approximately 2,200 feet west from Harrison Avenue to the Montana Department of Highways. West of the Department, it is a narrow gravel road with a very rough at-grade crossing over the Milwaukee Railroad track.

Traffic Data: Present average daily traffic immediately west of Harrison Avenue is about 750 vehicles per day. To the west of the Highway Department, traffic volumes are negligible. With reconstruction and designation as a truck route, 1990 traffic is forecast at 1,800 vehicles per day.

Recommended Improvements:

* Reconstruct Lowell Avenue from the Highway Department to the Western Beltway (2,150 feet), providing two (2) - twelve (12) foot paved travel lanes with ten (10) foot bituminous shoulders.

Montana Street from Rowe Road to Hansen Road

Project Number: R16

Problem: South Montana Street will form part of the proposed Western Beltway. Total distance is approximately 2,800 feet or 0.530 miles. The curb-to-curb pavement width is 53 feet with two traffic lanes and two parallel parking lanes. Pavement surface is bituminous and in average condition. A detailed examination of the pavement subsurface was not carried out; however, it is most likely designed for passenger cars and light trucks and would not adequately support heavy transport trucks.

Traffic Data: Average daily traffic for 1973 and 1990 is illustrated in Figures II-4 and VI-1, respectively. Growth through the planning period is from 2,000 to 7,200 vehicles per day. Since this will be part of the Western Beltway, truck traffic is expected to represent up to fifteen (15) percent of the daily traffic.

Recommended Improvements:

* Excavate the existing pavement and rebuild the subbase, base, and riding surface to provide for heavy truck traffic. Retain two lanes of traffic with parallel parking on both sides.

* Residential development borders the west side of the street; hence, lighting should be provided to illuminate pedestrians.

* Install signs to designate this street as a truck route.

Estimated Cost: $222,500

Priority: 2

NEW CONSTRUCTION

Six projects are recommended for new highway construction. Three of the projects form a beltway around the urban area south of the interstate. They include re-building Hansen Road, the Western Beltway, and the Southern Bletway. The remaining new construction consists of an east-west collector route between Harrison Avenue and Kaw Avenue, extension of Four Mile Road from Harrison Avenue across the airport (via a tunnel) to Continental drive, and the addition of two traffic lanes to Interstate Route 15.

The urban beltway is discussed as one project, while the remaining three are considered individually.

Urban Beltway

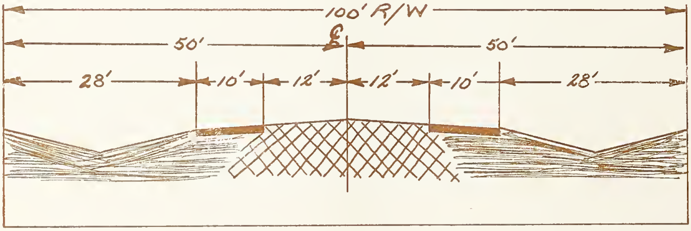
Project Numbers: N1, N2, and N3

Problem: South Harrison Avenue is the primary north-south artery serving the urban area south of IR15-90. Continental Drive and Interstate 90 border the eastern edge; however, there is no route to the west. Likewise, east-west travel south of the Bert Mooney County Airport is not possible. The purpose of the urban beltway is to link the "uptown area" with the south, while providing a new route somewhat parallel to Harrison Avenue. The section between Harrison Avenue and Continental Drive (south of the airport) completes the beltway and provides truck access from the Port of Butte to Interstate 90.

Traffic Data: Figure VI-1 shows projected 1990 average daily traffic. Volumes on the proposed route range from 1,000 to 7,000 vehicles per day.

Recommended Improvements:

* Construct a new two (2) lane roadway with the following cross-section. The roadway structure should be designed to handle heavy truck traffic.



* Install signs to designate this urban beltway as a truck route.

Estimated Cost: $2,167,900

Priority: 2

Collector Route Between Harrison Avenue and Kaw Avenue

Project Number: N4

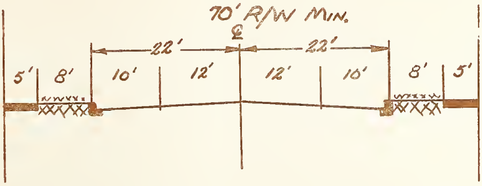
Problem: Commercial expansion is presently planned along Harrison Avenue across from the Civic Center. Perimeter traffic access is desirable as discussed under Phase 2 of Harrison Avenue recommended improvements between Front Street and Olympia Street (see Figure VI-12). This route should intersect Harrison Avenue just north of Silver Bow Creek directly across from the Civic Center Collector Route (see page VI-53).

Traffic Data: Figure VI-1 shows projected 1990 average daily traffic. Volumes averaged about 700 vehicles per day.

Recommended Improvements:

* A minimum right-of-way width of seventy (70) feet should be acquired prior to the start of any new commercial development south of the existing Albertson's store.

* Construct a new two (2) lane facility extending from George Street to Harrison Avenue. The proposed cross-section is illustrated below.



The length of the route is approximately 1,870 feet. Since George Street connects with Kaw Avenue and Montana Street, the proposed route will provide a continuous east-west collector between Montana Street and Continental Drive. The new route will provide access to residential uses, existing and future commercial development, the U. S. Post Office and the Civic Center.

Estimated Cost: $497,100

Priority: 1

Interstate 15 from Junction of IR15 and IR90 to Northeast Study Area Boundary

Project Number: N5

Problem: As stated in the Preface to this report, it was assumed that proposed Interstate Route 15 extends north from Interstate 90 along the eastern edge of the Butte urban area. This is not necessarily the Consultant's recommendation as it was not the purpose of this study to investigate various IR15 routes. Two (2) limited access travel lanes have been constructed and are open to traffic. If the final IR 15 alignment intersects IR90 at Butte, two additional traffic lanes will be required.

Traffic Data: Present average daily traffic is 700 vehicles per day. Future travel is forecast at 2,700 vehicles per day, representing an increase between 1973 and 1990 of 2,000 vehicles per day. The growth rate is just over eight (8) percent per year.

Recommended Improvements: A decision is expected in fall, 1973 from the Montana Department of Highways regarding which route Interstate 15 will follow between Butte and Boulder, Montana. That decision will control recommendations for this project. Routing directly north from Butte will require two additional controlled access travel lanes. Any alternate route would remove interstate designation from this portion of roadway, and negate need for additional travel lanes. In this latter case it would be possible to construct an at-grade intersection near Columbia Gardens for connection with Continental Drive.

Estimated Cost: $1,835,000 (Construct two additional lanes)

Priority: 1

Four Mile Road from Harrison Avenue to Continental Drive

Project Number: N6

Problem: The southeast quadrant of the Butte urban area, situated south of Interstate 15-90 and between Harrison Avenue and Continental Drive, has poor east-west access. Elizabeth Warren Drive presently serves east-west travel; it crosses over the Butte Country Club golf course and alignment is poor. Also, airport runway #15-33 may be extended to the north, which would require closing or relocation of Elizabeth Warren Drive.

Alternate improvements were examined and tested. As discussed in Chapter V, the extension of Wharton Street, located just south of the interstate, loaded well with up to 6,900 vehicles per day. However, it was not recommended due to undesirable impacts on existing residential areas. Three other alternates were studied:

1. Improvement and partial relocation of Elizabeth Warren Drive. Estimated cost, $524,000.

2. Westward extension of Blacktail Lane to the airport boundary, then north and parallel to the airport to connect with Elizabeth Warren Drive. Estimated Cost, $775,000.

3. Westward extension of Blacktail Lane directly across the airport (via a tunnel under runway #15-33) to the intersection of Harrison Avenue and Four Mile Road. Estimated Cost, $2,782,800.

The first alternate was considered infeasible because of residential development along the east end of Elizabeth Warren Drive. Even with relocation north of the airport, the route still crosses the golf course.

Alternate 2 offers the advantage of direct access to the IR90 interchange; however, it would involve 1.87 miles of new roadway construction.

The third alternative is the most costly. However, it would provide the best east-west connection for the south urban area. It has the advantage of connecting with Four Mile Road west of Harrison Avenue which extends to the proposed Western Beltway.

Recommended Improvements:

* One basic assumption adopted at the outset of this transportation study was that the Bert Mooney Silver Bow County Airport will remain in its present location. With that assumption and the likelihood of runway extension a definite possibility, east-west travel should be provided by connecting Blacktail Lane with Four Mile Road. A tunnel underneath runway #15-33 should be constructed.

Runway #11-29 is classified as a General Utility Runway. Its 1,000 foot clear zone is shown in Figure II-8 and extends above the intersection of Harrison Avenue and Four Mile Road. The Airport Feasibility Study** states that the existing runway meets Federal Aviation Administration requirements for a General Utility Runway. No expansion of the existing runway is recommended so the extension of Four Mile Road will not violate Federal Aviation Administration requirements.

MISCELLANEOUS IMPROVEMENTS

Butte - Silver Bow County residents are to be commended for their emphasis on transportation and for the many recently completed highway improvements. Many signals have been updated through aid from the Federal Highway Administration and the Montana Department of Highways, most arterials have good riding surfaces, and a program is underway to maintain adequate pavement markings. Additional improvements should be examined:

* Analyses in this study indicated that the existing fixed time traffic signal at the intersection of Excelsior Avenue and Caledonia Street does not satisfy the warrants for a traffic signal. Accidents at this location could result in legal action against the City by the injured parties. The operational characteristics of this intersection should be examined in detail to determine if the signal should be upgraded or removed.

** Morrison - Maierle, Inc. Airport Site Feasibility Study; Silver Bow County; May, 1972; p. 11.

* Motorists proceeding from the Butte central business district along North Main Street to Walkerville must ascend a very steep grade. There are sections of this roadway where a vehicle could easily plunge over a steep embankment. Guard rails should be placed at these locations.

* The southbound Utah Avenue approach to Front Street has a double left turn lane. A solid line between these lanes extending around the corner to Front Street would guide turning movements at this intersection.

* A sign inventory should be conducted, followed by analyses and subsequent updating of all signs to conform to the Uniform Manual of Traffic Control Devices. It is the goal of the Federal Highway Administration to reach nationwide conformance of pavement marking standards by 1973, traffic signs by 1975, and signals by 1977. Substandard traffic control devices are a liability to the City and can result in damage suits for accidents occurring as a direct result of substandard signs or signals. Funding to upgrade traffic control devices may be available from the Highway Traffic Safety Division.

* Operational agreements relating to improvements on the primary system have not been conformed with. These include full use of signal capabilities for coordination and the removal of parking on some sections. These agreements should be met by enforcing parking restrictions and using the full capabilities of the new signals which were installed

under the Federal 9999's program. Failure to meet these requirements will jeopardize future federal and state improvement programs.

* Butte - Silver Bow City - County Planning Board, with the aid from consultant Stevens, Thompson, and Runyan, is presently preparing a central business district plan for redevelopment. Improvements recommended in this plan, in particular those in Chapter VII, should be closely coordinated with recommendations outlined in the Central Business District Plan.

* The Montana College of Mineral Science and Technology and the Butte Vocational - Technical Center are presently investigating future expansion onto land located west of the school of mines and north of Interstate Route 115. Approximately 213 acres of land have been requested by the two schools from the Anaconda Company. As development plans for the campus are formulated, this Plan should be updated to include adequate transportation facilities to serve the complex.

Location of transportation facilities will be dependent upon the number of students, the number of commuters to each school, and the location of buildings and parking areas. Planning for this education complex should consider a perimeter arterial route with a minimum of interior streets to provide service access. A pedestrian oriented campus will be safe, efficient, and attractive to students. The perimeter arterial should be connected with the urban area's major transportation system. Park Street is programmed for upgrading to four (4) lanes and will provide direct access between the new campus and the central business district. Traffic access should also be provided near the south end of the campus. This can be accomplished most economically by connecting with the interstate at the Excelsior Avenue interchange.

parking

CHAPTER 7

Chapter VII

PARKING

GENERAL

The purpose of this chapter is to analyse parking deficiencies and surpluses in the central business district, and to set forth recommendations for improved parking regulations and additional parking facilities. Analyses are presented separately for existing conditions and for the forecast year, 1990.

A comprehensive parking survey was conducted within the Butte central business district in 1964 by the Planning Survey Division of the Montana Department of Highways. Parking supply, including curb spaces, off-street lots, and garages, were inventoried. Parking demands for each block face were determined by personal interviews with parkers in the area. Parking surpluses and deficiencies were calculated by comparing supplies with demands. The results and recommendations of that survey are summarized below:

* A deficiency of 455 parking spaces was determined. Location of these deficiencies is illustrated in Figure VII-2.
* Construction of an off-street parking garage was recommended along the north side of Broadway Street between Wyoming and Main Streets. This facility has been built and presently has a capacity of approximately 125 vehicles.

* The 1964 survey reported that fourteen (14) percent of the total parkers in the survey area were double parked. More strict enforcement of parking restrictions was recommended.

* Other minor parking restrictions, such as creation of twenty (20) foot no parking zones adjacent to pedestrian crosswalks, were recommended.

Between 1964 and 1973, a number of changes occurred in the central business district which affected parking supplies and demands. The most significant were as follows:

* Approximately 400 additional off-street parking spaces were added. Since the 1964 Parking Survey reported a need for 455 spaces, Butte should be commended for implementing the report's recommendations. However, new spaces did not relieve deficiencies on a one for one basis because their locations did not exactly coincide with the parking needs.

* Angle parking along Main Street and Montana Street was converted to parallel parking. This resulted in a loss of 96 spaces.

* Parallel parking along Arizona Avenue, between Mercury and Granite Streets, was removed, resulting in a loss of 41 spaces.

* In February, 1972, Penney's department store and a few other smaller businesses located along the north side of Park Street at Dakota Street, were destroyed by fire. There was a corres-

ponding reduction in the parking demand in the immediate vicinity. Many businesses, however, relocated to other buildings within the central business district.

* A second major fire occurred in July, 1973. The Medical Arts Building and the Hoffman Block, located on the northeast corner of Park and Main Streets, were destroyed. At the printing of this report, businesses are in the process of assessing damage and relocating. The full affect of this fire on the central business district will not be known for some time.

Parking analyses involve a block by block comparison of existing supplies with actual parking demands. The latter can be obtained from various sources, such as interviews with parkers, floor space requirements, or origin-destination data. This study utilized the origin-destination survey to determine 1970 demands, and forecast year trip productions and attractions to determine 1990 parking requirements.

ASSUMPTIONS

The 1964 Parking Survey interviewed parkers at each individual block face. The 1970 origin-destination data was available for each block within the central business district. It was assumed that the 1970 destinations per block could be distributed to block faces in the same ratio as determined in the 1964 parking survey.

Space hours of parking demand was obtained by assuming that the 1970 parking duration was consistent with 1964 durations. The basis of this assumption was consistency of parking duration by trip type for similar studies conducted in Butte, Billings, Great Falls, Helena and Missoula. Average trip duration for each study was within a few minutes of one (1) hour.

A third assumption was necessary in order to update 1970 origin-destinations per block to reflect conditions in 1973. It was assumed that activity in the central business district has remained approximately constant. A few shops have relocated out of the uptown, while others have remodeled and improved the attractiveness of their businesses. Activity decreases were assumed in the vicinity of the two major fires. Corresponding increases were noted in other zones in the central business district, reflecting business relocations.

The last assumption recognizes the northwest corner of Park and Dakota Streets and the northeast corner of Park and Main Streets as prime business locations and assumes that these locations will be developed in the future.

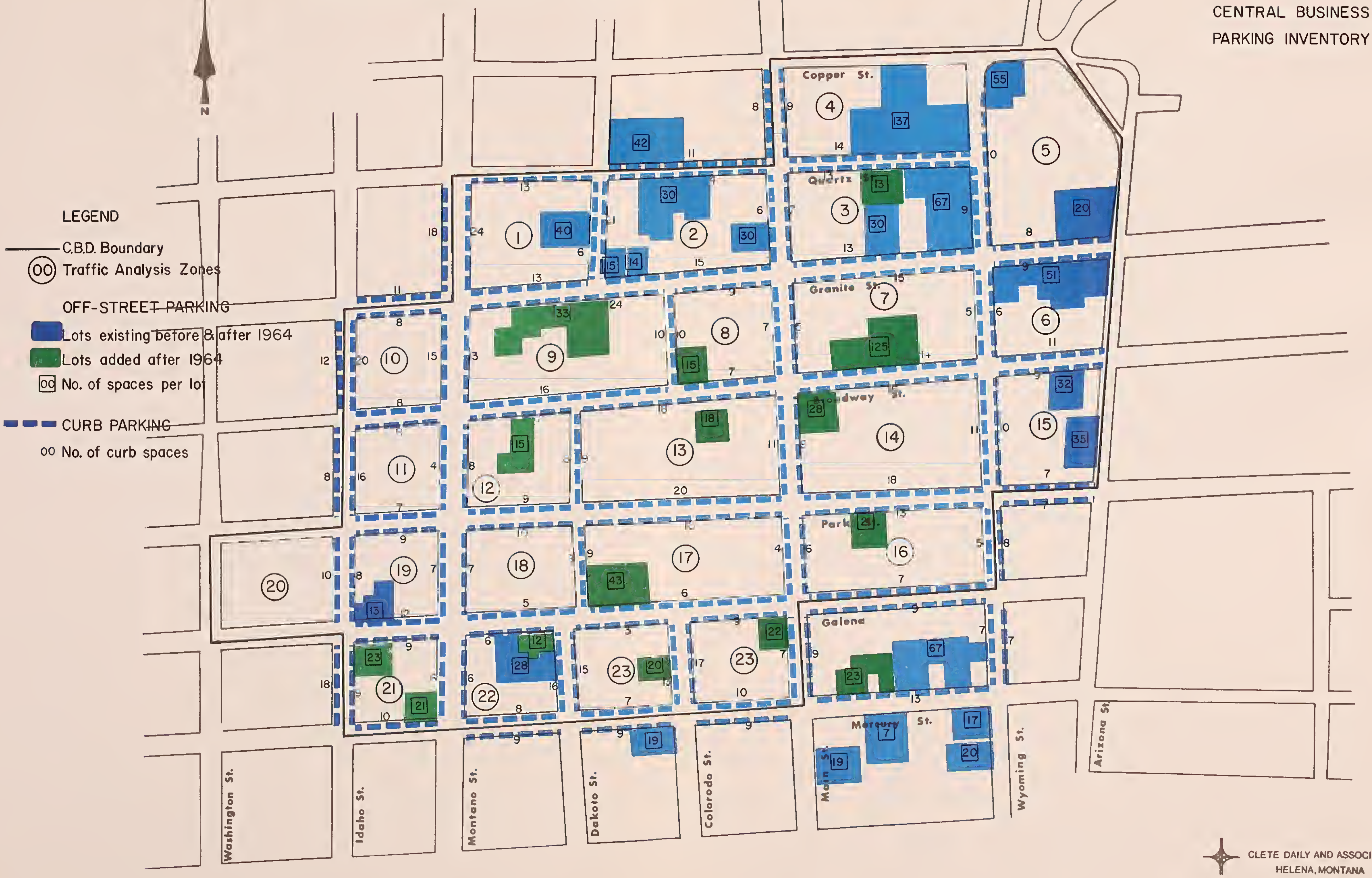
ANALYSES OF EXISTING CONDITIONS

Parking supplies are illustrated in Figure VII-1. Off-street parking provided since 1964 is shown separately. A considerable number of new spaces have been added. The study area used in 1964 was somewhat larger than that for 1973; however, available supplies for the two points in time can be compared for each block. Table VII-1 summarizes the number of curb and off-street spaces for comparable study areas.

BUTTE URBAN
TRANSPORTATION STUDY

FIGURE VII-I

CENTRAL BUSINESS DISTRICT
PARKING INVENTORY



CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Table VII-1

COMPARISON OF 1964 AND 1973 PARKING SUPPLY

Parking Type	Number of Spaces		Change	
	1964	1973	Number	Percent
Curb	1,128	991	-137	-12.1
Lot	424	828	+404	+95.3
Total	1,552	1,819	+267	+17.2

Assuming an eight (8) hour day beginning at 9:00 a.m., available space hours of supply were computed for each block face. One hundred percent (100%) of available supply can never be used due to inefficiencies of parking. To be consistent with the 1964 survey, practical supplies were obtained by multiplying curb and lot space hours by 90 percent and 85 percent, respectively. The resulting practical supply is 12,765.6 space hours.

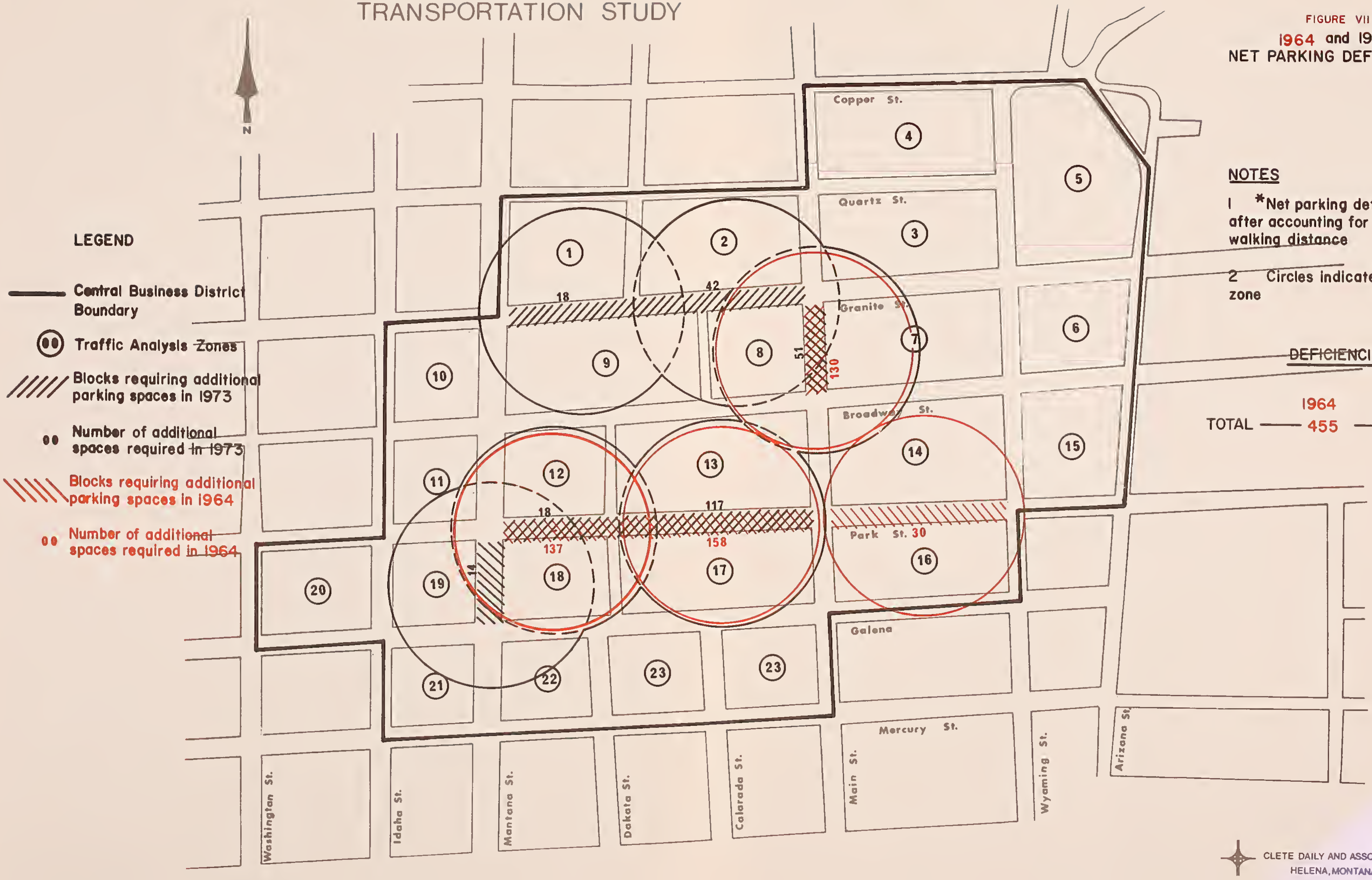
Parking demands for each block face were determined by distributing total destinations per block to individual block faces in the same proportion determined by the 1964 survey. Using parking durations consistent with the 1964 survey, space hours of demand for each block face were calculated.

Parking supplies and demands were compared for each block face. Deficiencies or surpluses were found. They are shown in Table VII-2. A deficiency along one particular block face can be relieved by a surplus in an adjacent block provided the walking distance is not excessive. Using an acceptable walking distance of 300 feet, net deficiencies and surpluses were found for each street section. The results are indicated in Figure VII-2.

BUTTE URBAN TRANSPORTATION STUDY

FIGURE VII-2

1964 and 1973
NET PARKING DEFICIENCIES*



LEGEND

▬ Central Business District Boundary

⓪⓪ Traffic Analysis Zones

//// Blocks requiring additional parking spaces in 1973

00 Number of additional spaces required in 1973

\\\\ Blocks requiring additional parking spaces in 1964

00 Number of additional spaces required in 1964

NOTES

1 *Net parking deficiencies result after accounting for 300' acceptable walking distance

2 Circles indicate 300' walking zone

DEFICIENCIES

	1964	1973
TOTAL	455	260

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Table VII-2

BUTTE CENTRAL BUSINESS DISTRICT PARKING

SURPLUSES AND DEFICIENCIES - 1973

Street	Section	Surpluses	Deficiencies
Montana	Mercury - Galena	--	3
	Galena - Park	--	29
	Park - Broadway	10	--
	Broadway - Granite	12	--
Dakota	Mercury - Galena	58	--
	Galena - Park	7	--
	Park - Broadway	16	--
Alaska	Granite - Quartz	22	--
Colorado	Mercury - Galena	28	--
Hamilton	Broadway - Granite	12	--
Main	Galena - Park	--	1
	Park - Broadway	2	--
	Broadway - Granite	--	134
	Granite - Quartz	10	--
Wyoming	Park - Broadway	13	--
	Broadway - Granite	--	10
	Granite - Quartz	4	--
Galena	Idaho - Montana	51	--
	Montana - Dakota	--	2
	Dakota - Colorado	22	--
	Colorado - Main	20	--
Park	Idaho - Montana	--	6
	Montana - Dakota	--	83
	Dakota - Main	--	139
	Main - Wyoming	18	--*
Broadway	Idaho - Montana	--	2
	Montana - Dakota	--	2
	Dakota - Main	34	--
	Main - Wyoming	116	--
	Wyoming - Arizona	25	--
Granite	Montana - Alaska	--	73
	Alaska - Main	--	89
	Main - Wyoming	12	--
	Wyoming - Arizona	26	--
Total		518	573

* Adjustments made to account for July, 1973 fire.

There is a sufficient supply of parking spaces in the Central Business District if parkers were willing to walk up to 1,200 feet to their destination. The 1964 survey showed an average walking distance of 236 feet.

The distribution of surplus spaces is not adequate and additional spaces are required along a few blocks. Suggested locations for additional off-street parking are discussed at the end of this chapter.

1990 CENTRAL BUSINESS DISTRICT PARKING REQUIREMENTS

During development of this Urban Transportation Plan, the Butte City-County Planning Board has been working with a consultant to prepare a Central Business District Plan. Some of the pertinent facts from that Plan are as follows:

* The economic viability of uptown Butte is declining and will continue to decline due to overbuilt retail floor space, many old deteriorating buildings that cannot be economically rehabilitated, competing fringe area shopping centers, and the location of valuable mineral reserves underneath the central business district.

* Activity in uptown Butte will decline in future years. Reasons given include existing market conditions, probable exodus of some businesses from the central business district, westward mining expansion, and the fact that the present business district is not central to growth patterns of the city.

On the basis of these conslusions, the preliminary plan recommended "redevelopment, on a phased withdrawal basis, of the present uptown area and the development of a new community to contain facilities for a new central business district and new housing". The plan further recommends a three (3) stage redevelopment program. Each stage is briefly summarized below:

> Stage 1 involves the planning and design of a new business district, removal of deteriorated buildings in the present central business district, and redevelopment of those buildings which can economically be brought up to code. The plan encourages redevelopment on the western edge of the central business district near Montana Street.
>
> Stage 2 begins when space becomes available in the new central business district. Uptown business may choose to relocate to the new development, relocate to another commercial site, or remain in their present locations and possibly move to a redeveloped building on the west end of the present central business district.
>
> Stage 3 takes place when the new central business district is actively recognized as the core shopping area for the Butte urban area. At that time, the plan foresees a three block neighborhood shopping center clustered about Montana Street, between Galena and Granite Streets. Some consideration has been given to creation of a pedestrian mall with one-way traffic circulation around the shopping center, using Idaho Street and Dakota Street.

At this time, Butte - Silver Bow County has not adopted the new central business district redevelopment concept. This Transportation Plan assumes that activity in the uptown area will be similar to that existing in 1972. However, to correlate with Stage 1, some redevelopment west of the existing central business district has been assumed. Figure VII-3 graphically portrays a comparison of 1973 and 1990 zone destinations and illustrates which blocks are forecast to have increased or decreased business activity. Note that major increases are primarily centered about Montana Street, while most of the decreases are in the eastern section of the uptown area. This reflects the gradual development of the Neighborhood Shopping Center in the vicinity of Montana and Park Streets.

Using 1990 forecast destinations as presented in Figure VII-3 parking demands were calculated for each individual block face. These were compared with existing parking supplies to determine parking deficiencies or surpluses for each block. These are tabulated in Table VII-3. Considering an acceptable walking distance of 300 feet, net parking deficiencies and surpluses were found for each block. They are shown graphically in Figure VII-4.

A comparison of Figures VII-2 and VII-4 indicates similar parking demands for the two time periods, 1973 and 1990. The primary difference occurs because of the shift of business activity toward the west portion of the central business district. For this reason, parking space requirements become increasingly accute in the vicinity of Montana and Dakota Streets.

Table VII-3

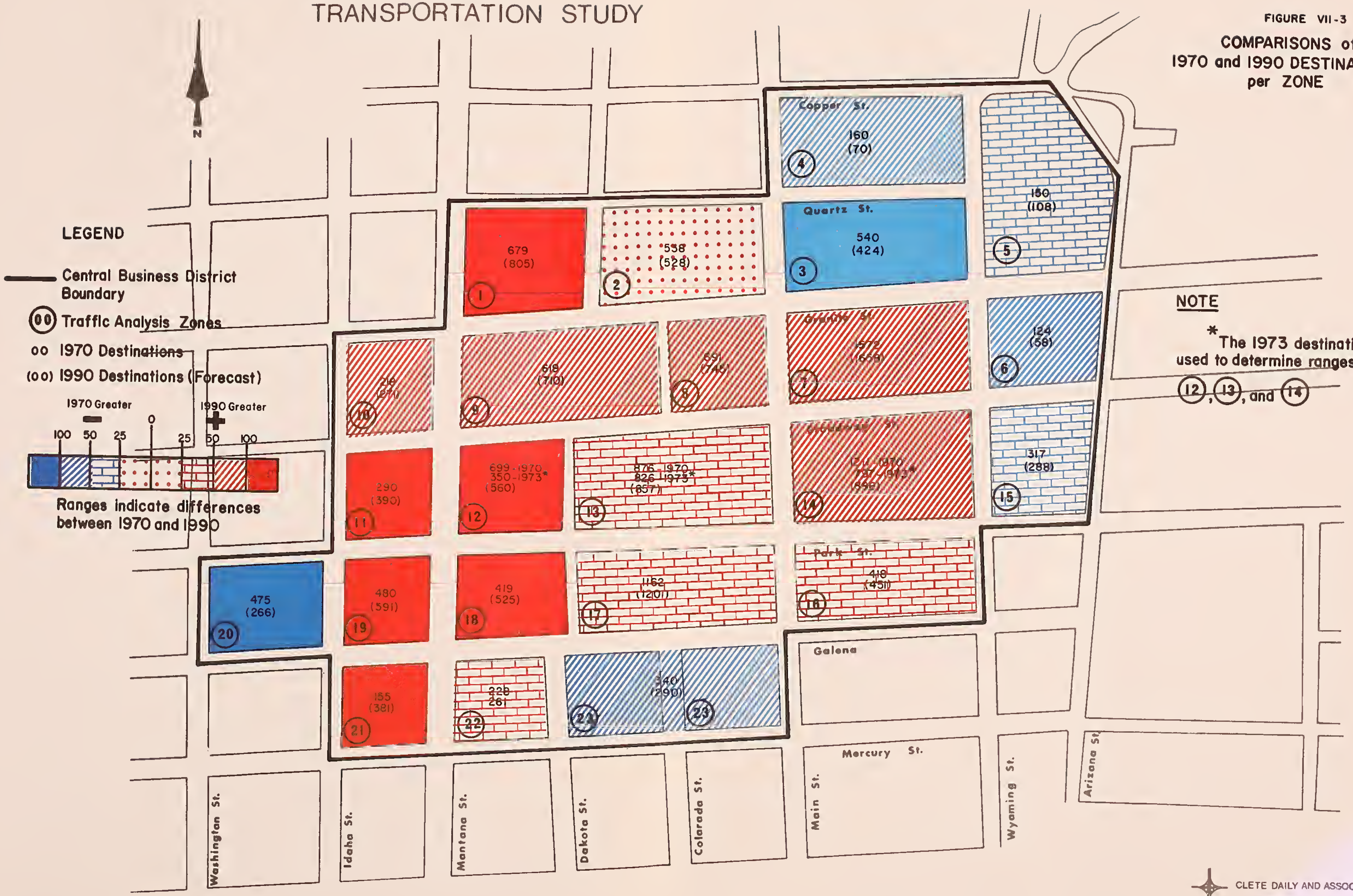
BUTTE CENTRAL BUSINESS DISTRICT PARKING
SURPLUSES AND DEFICIENCIES - 1990

Street	Section	Surpluses	Deficiencies
Montana	Mercury - Galena	--	--
	Galena - Park	--	25
	Park - Broadway	10	--
	Broadway - Granite	6	--
Dakota	Mercury - Galena	60	--
	Galena - Park	6	--
	Park - Broadway	16	--
Hamilton	Broadway - Granite	11	--
Alaska	Granite - Quartz	21	--
Colorado	Mercury - Galena	28	--
Main	Galena - Park	--	2
	Park - Broadway	--	3
	Broadway - Granite	--	142
	Granite - Quartz	14	--
Wyoming	Park - Broadway	14	--
	Broadway - Granite	--	10
	Granite - Quartz	13	--
Galena	Idaho - Montana	--	25
	Montana - Dakota	--	2
	Dakota - Colorado	26	--
	Colorado - Main	20	--
Park	Idaho - Montana	--	19
	Montana - Dakota	--	74
	Dakota - Main	--	142
	Main - Wyoming	--	4
Broadway	Idaho - Montana	--	13
	Montana - Dakota	--	7
	Dakota - Main	30	--
	Main - Wyoming	123	--
	Wyoming - Arizona	35	--
Granite	Montana - Alaska	--	102
	Alaska - Main	--	90
	Main - Wyoming	14	--
	Wyoming - Arizona	35	--
TOTAL		482	660

BUTTE URBAN TRANSPORTATION STUDY

FIGURE VII-3

COMPARISONS of 1970 and 1990 DESTINATIONS per ZONE



LEGEND

▬ Central Business District Boundary

⓪⓪ Traffic Analysis Zones

00 1970 Destinations

(00) 1990 Destinations (Forecast)

1970 Greater —				0			1990 Greater +
100	50	25			25	50	100
🟦	▨	▦	⁙	⁙	▦	▨	🟥

Ranges indicate differences between 1970 and 1990

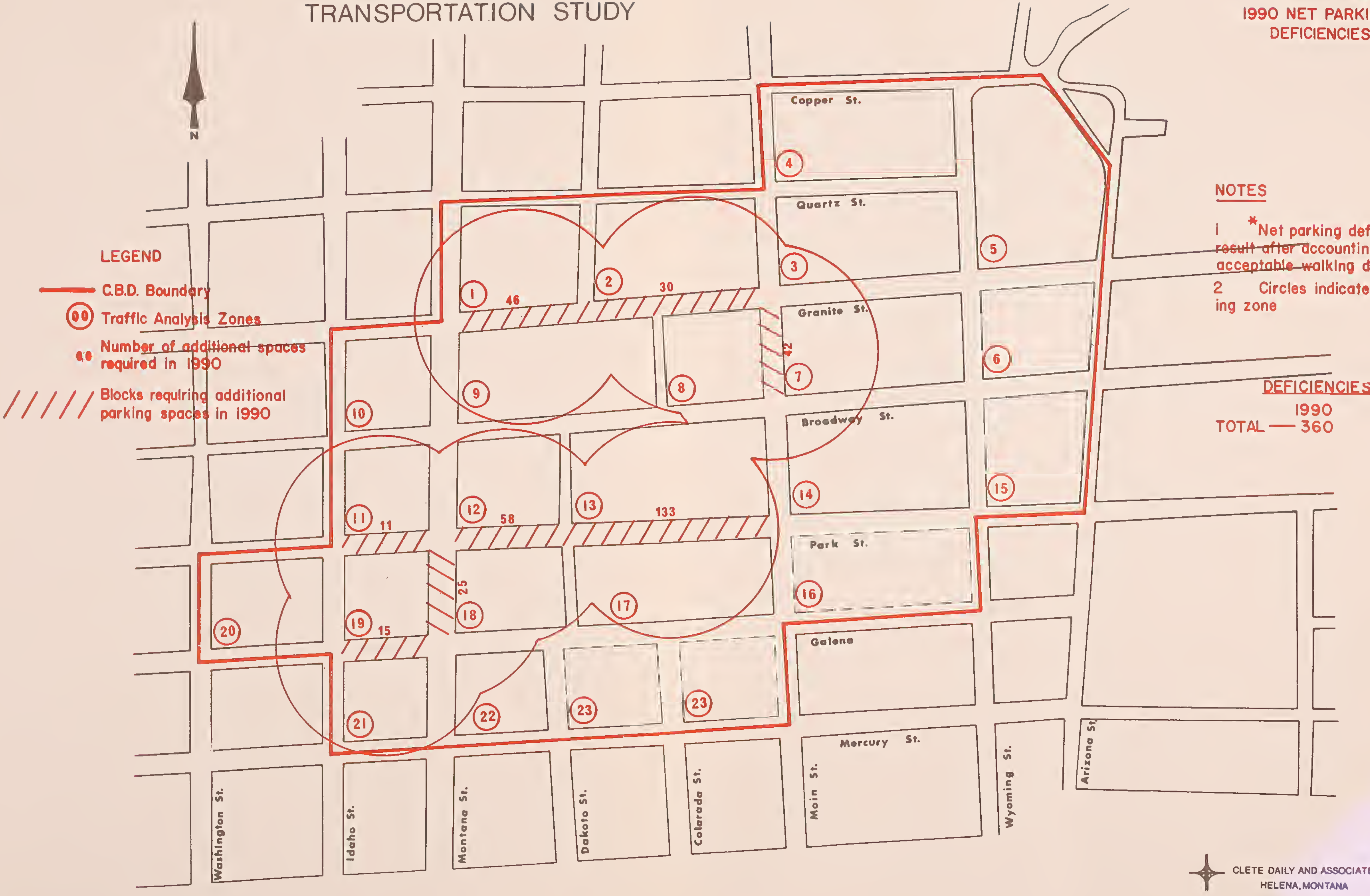
NOTE

* The 1973 destinations were used to determine ranges for zones ⑫, ⑬, and ⑭

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

BUTTE URBAN
TRANSPORTATION STUDY

FIGURE VII-4
1990 NET PARKING DEFICIENCIES*



LEGEND

▬ C.B.D. Boundary

(00) Traffic Analysis Zones

0.0 Number of additional spaces required in 1990

///// Blocks requiring additional parking spaces in 1990

NOTES

1 *Net parking deficiencies result after accounting for 300' acceptable walking distance

2 Circles indicate 300' walking zone

DEFICIENCIES

1990

TOTAL — 360

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

RECOMMENDATIONS

- A minimum of 260 additional off-street parking spaces should be provided in the Butte central business district to meet 1973 deficiencies. One hundred (100) more will be needed by 1990. A number of sites are suggested in Figure VII-5. Also shown is the approximate capacity of each lot. The suggested lots are divided into two groups and listed according to priority 1 and priority 2. First priority lots (289 spaces shown) are needed to satisfy existing deficiencies and should be implemented as quicking as possible. The second priority is assigned to lots (113 spaces shown) for which planning should begin, but actual parking lot construction should take place as warranted by future developments.

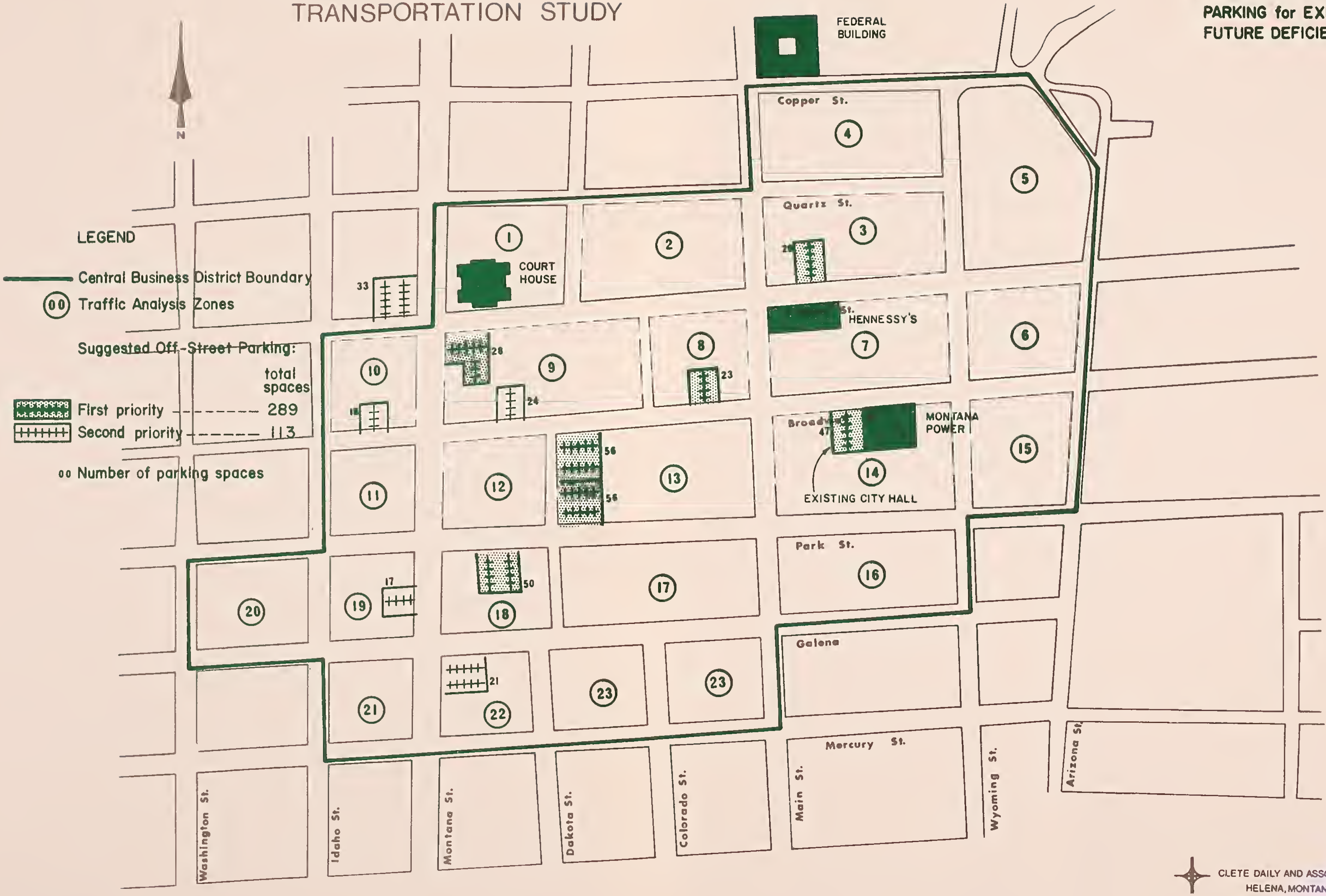
  It should be pointed out that plans are presently being made to relocate the city hall (presently in zone 14) to zone 21. The suggested lot in zone 22 should be constructed as part of this project.

- Traffic patterns in uptown Butte have been observed on many occasions during the past year and a half. Double parking is a definite problem and should be eliminated. It results from trucks making deliveries and private passenger cars parking at will. Deliveries cannot be prohibited; however, they could be restricted to special reserved curb zones or side streets so that traffic flow would not be inpaired. Double parking of passenger cars should be controlled by enforcement.
- Parking revenues have increased during the past two years. Total receipts for lot spaces and curb spaces are shown in Table VII-4.

BUTTE URBAN TRANSPORTATION STUDY

FIGURE VII-5

SUGGESTED OFF-STREET PARKING for EXISTING and FUTURE DEFICIENCIES



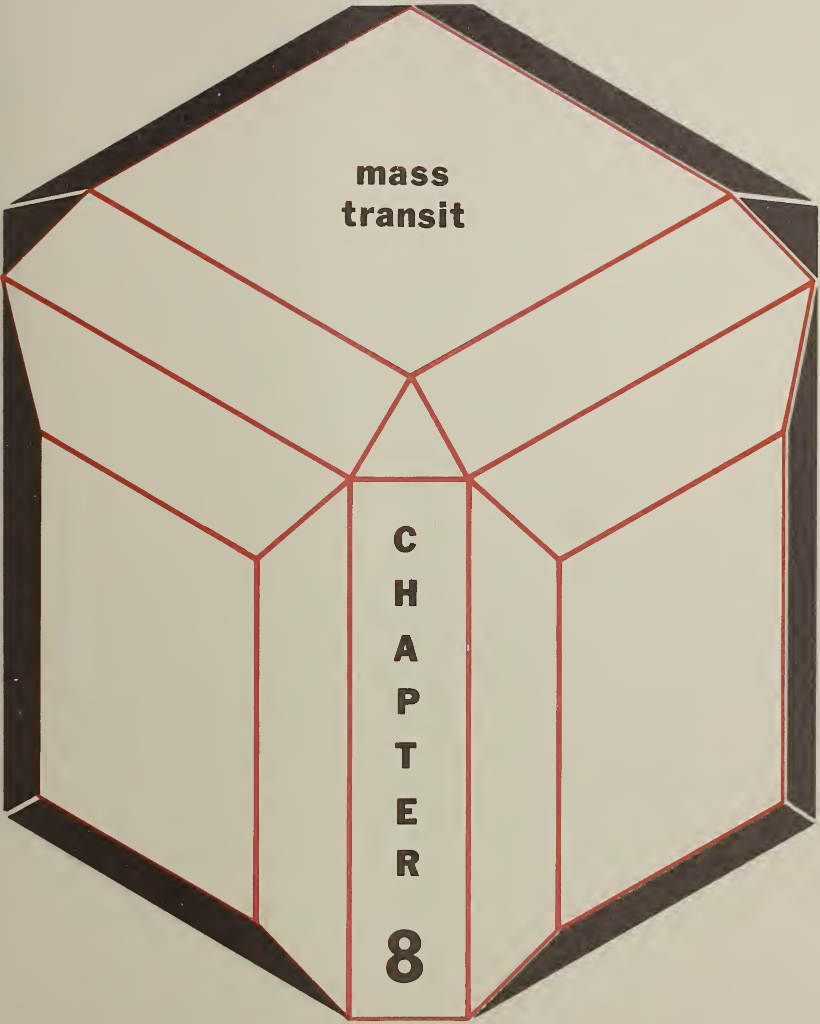
CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Table VII-4

PARKING SPACE REVENUES

	Revenues	
Time Periods	5/71 - 4/72	5/72 - 4/73
Lots	$ 9,727.72	$12,167.79
Curbs	$71,471.14	$72,465.59
Total	$81,198.86	$84,633.38

The City of Butte presently has an active parking development program. Through lease agreements with private owners, additional off-street parking has been developed on a paying basis. The site of the old Penney's store is presently being developed for off-street parking through a joint agreement between the City and the owner. These programs should be continued.



mass transit

CHAPTER 8

Chapter VIII

MASS TRANSIT

Butte and Billings are the only urban areas in Montana that have been able to sustain mass transit operation over the past twenty years.

HISTORY

A brief chronological history of transit service in Butte is summarized below:

1886	Butte became the second Montana city with permanent interurban transportation with the beginning of operation of a 1.5 mile horse car line.
1890	The first electric trolley cars began operation in Butte with the first route running to Meaderville.
1905	Butte's worst trolley accident occurred when an open car was hit broadside by a Butte, Anaconda and Pacific freight train killing ten (10) and seriously injuring twenty-eight (28) persons. The car had more than one hundred (100) passengers aboard and was returning from the Columbia Gardens at about 10 o'clock in the evening.
1908	The Butte Electric Railway acquired the equipment of the Bozeman Street Railway Company. The Butte Electric Railway

system consisted of thirty-nine (39) motor passenger cars, nine (9) freight motor cars, operating on 25.5 miles of line.

1910 The Butte Electric Railway system had grown to forty-nine (49) passenger cars and 33 miles of line. The system was serving a population of 43,624.

1914 The system consisted of 34.5 miles of line, sixteen (16) double track passenger cars and forty-five (45) single trackers.

1916 The Butte Electric Railway carried 10,911,829 passengers over 1,467,617 car miles and used power amounting to 4,544,619 kilowatt hours. Fares were five cents (5¢) for adults and two and one half cents (2½¢) for children.

1923 The Butte Electric Railway purchased three - 29 passenger Fageol motor buses. Two more were purchased in 1927.

1924 One of the last track extensions into the McQueen Addition.

1933 The Butte Electric Railway system was operating fifty-seven (57) passenger motor cars, four (4) work cars and one snow plow.

1937 Street cars were discontinued - bus operation began.

1957 Operation suspended.

1958 Operation started but again discontinued.

1959-61 Operation resumed - business poor.

1962 Butte Bus Lines took over operations with two buses, owner/driver.

1968	Anaconda Company strike reduces ridership.
1969	Peak of present operation - six (6) regular buses - six routes at 30 minute intervals.
1969 (Fall)	School bus transportation provided for students outside three (3) mile radius, school class schedule reduced from two (2) shifts to one (1) resulting in ridership loss.
1970-1973	Decreasing profit due to high operation and maintenance costs.

EXISTING BUS SERVICE

The following section evaluates the existing bus operations.

Franchises

Butte Bus Lines own Montana Railroad Commission Permit Number 1550. The class A portion permits service in Butte and to and from points within eight (8) miles of the city limits. The class B portion permits charter service to and from any point in the state with the provision that one end of the trip is the city of Butte.

Each year the Butte Bus Lines request the suspension of the class A portion of their permit and operate under the city of Butte's class A Permit Number 2726. This eliminates the state of Montana fuel tax of four cents (4¢) per gallon.

Inventory

Butte Bus Lines operate out of a shop and garage located on Kaw Avenue just north of Front Street. The structure is of wood construction. The office and garage are in poor repair and present a poor image to anyone coming to the office to pick up schedules or to inquire about charter service. As a maintenance facility, the garage is well located in an outlying industrial area with adequate room for parking.

Butte Bus Lines also owns another garage constructed of metal sheets on a wood frame. It was constructed in 1971 and has room for inside storage of eight (8) buses. The building is located south of Butte, directly west of the Montana Department of Highways shop building and is used primarily for the maintenance and storage of school buses.

The Lines own a two way radio system composed of a central radio at the Kaw Avenue office and radios in most of the buses operating in Butte. There are three (3) spare radios available for emergency backup. The radios are fully depreciated, but are in fair operating condition.

Table VIII-1 lists the Butte Bus Lines rolling stock.

Table VIII-1

BUTTE BUS LINES' ROLLING STOCK

Number of Buses	Seats	Make	Year
1	40	GMC	1944
2	36	GMC	1946
2	36	GMC	1952
1	48	GMC	1953
1	45	GMC	1955
2	51	GMC	1955
2	45	GMC	1956
1	35	GMC	1958

Others:

1	Dodge 4 wheel drive power wagon.
10	School buses 1969-1971, assorted makes.
2	Greyhound type charter buses, one 1955 GMC and one 1958 GMC.

The forty-five (45) passenger GMC transit buses are currently being used for the transit operations in Butte. Two - 51 passenger 1955 GMC buses are for sale and the 1953 GMC is used as a substitute transit bus. One 1946 bus is in running condition, however, the other is being canabalized for parts. Both 1952 buses are also being canabalized. The 1944 bus is valueless and in complete disrepair. The Dodge power wagon is used as a service truck.

Most of the rolling stock is paid for and the transit buses are 90 percent depreciated.

Personnel

From the original two owner/driver operation, the Butte Bus Lines have presently reached a payroll of twenty-four (24) persons. One is a part-time accountant while two others are full-time mechanics. Two are owner/drivers, one is a full-time office girl and the remaining are full-time drivers.

Ten years ago (1962) the pay for the drivers was $2.00 per hour. The current pay scale is $2.27 per hour. Fringe benefits include 80 percent of hospital insurance paid for by the company. The employees receive nine (9) paid holidays per year. After one year an employee gets one week paid vacation; after two or more years of service, each receives two weeks of paid vacation.

Routes and Schedules

Presently there are seven (7) transit routes. These include Englewood, Racetrack, McQueen, Oregon Avenue, Montana Street, West Side and Walkerville. Three buses service these routes in groups, i.e. Oregon

Avenue - McQueen - Montana Street, Walkerville - Racetrack, and West Side - Englewood. Figure VIII-1 shows the coverage of these routes.

All buses start their routes at 7:00 a.m. and finish at 7:00 p.m. It takes each bus one hour to complete one circuit. Intermediate stops are at the intersections of Park and Main Streets and at Broadway and Main Streets. They are the only permanent marked stops on the routes. Signs designating "Bus Stop" have been installed; however, there are no shelters or benches.

Buses will stop on the near side of any intersection approach. They stop at such places as hospitals, rest homes, etc., only if passengers are waiting in front, or a passenger on the bus wishes to disembark.

Buses used on the transit routes were painted different colors (i.e. orange, green, etc.) with no markings on the outside. The bright colors resulted from a 1970 campaign to attract attention and brighten the appearance of the buses.

Bus interiors are kept clean by sweeping at regular intervals; a few have scattered advertisements. Schedules are not posted, although the drivers keep pamphlets on hand illustrating routes and the time of runs. Table VIII-2 shows the present operating schedule. Buses do not run on Sundays and legal holidays.

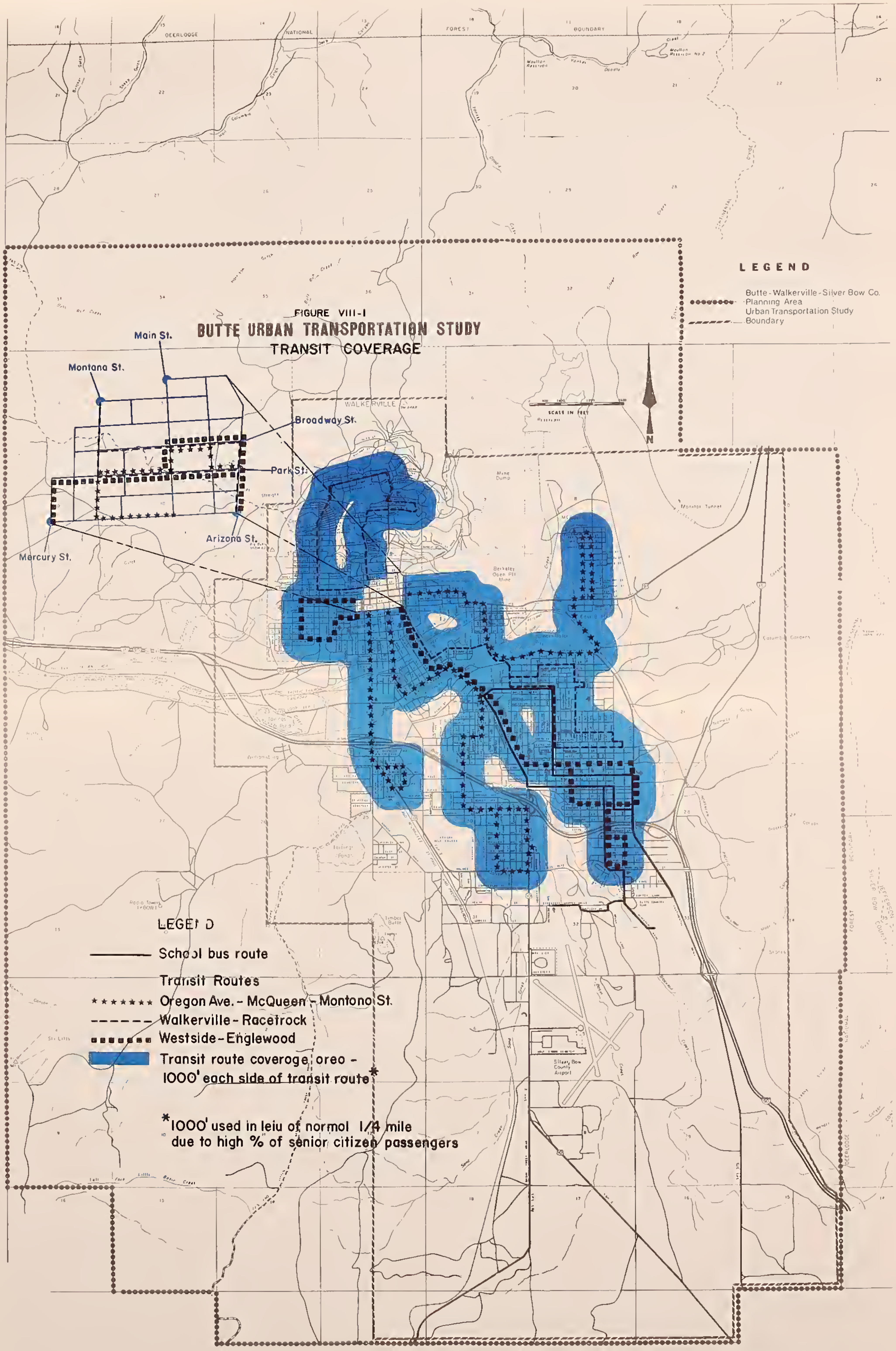
Charter Operations

The Butte Bus Lines operate two buses on a charter basis. Charter operation is limited to the state of Montana. The Montana Railroad Commission permit restricts operations to those with origin

FIGURE VIII-1

BUTTE URBAN TRANSPORTATION STUDY

TRANSIT COVERAGE


Main St.
Montana St.
Broadway St.
Park St.
Arizona St.
Mercury St.
WALKERVILLE
N
SCALE IN FEET
Berkeley Open Pit Mine
Mine Dump
Columbia Gardens
Timber Butte
Silver Bow County Airport
LEGEND
Butte-Walkerville-Silver Bow Co. Planning Area
Urban Transportation Study Boundary
LEGEND
School bus route
Transit Routes
★★★★★★★ Oregon Ave. - McQueen - Montono St.
------ Walkerville - Racetrock
■■■■■■■ Westside - Englewood
Transit route coveroge oreo - 1000' each side of transit route*
*1000' used in leiu of normol 1/4 mile due to high % of senior citizen passengers

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

Table VIII-2

BUTTE BUS LINES' TRANSIT SCHEDULE

One Bus				One Bus			
Walkerville------Racetrack				Englewood---------West Side			
Bdway. & Main	Daly & Main	Park & Main	St. Ann & Hancock	Park & Main	E. Lake & Whiteway	Bdway. & Main	Emmet & Platinum
7:18	7:30	7:45	7:00	7:10	7:30	7:53	8:00
8:18	8:30	8:45	8:00	8:10	8:30	8:53	9:00
9:18	9:30	9:45	9:00	9:10	9:30	9:53	10:00
10:18	10:30	10:45	10:00	10:10	10:30	10:53	11:00
11:18	11:30	11:45	11:00	11:10	11:30	11:53	12:00
12:18	12:30	12:45	12:00	12:10	12:30	12:53	1:00
1:18	1:30	1:45	1:00	1:10	1:30	1:53	2:00
2:18	2:30	2:45	2:00	2:10	2:30	2:53	3:00
3:18	3:30	3:45	3:00	3:10	3:30	3:53	4:00
4:18	4:30	4:45	4:00	4:10	4:30	4:53	5:00
5:18	5:30	5:45	5:00	5:10	5:30	5:53	6:00
6:18	6:30	6:13	6:00	6:10*			

One Bus					
Oregon Avenue---------------McQueen---------------Montana Street					
Bdway. & Main	Harrison & Holmes	Park & Main	Leatherwood & Garfield	Bdway. & Main	Clinton & Parrot
7:40**	6:55	8:15	8:30	9:15	7:05
8:40	7:55	12:15	12:30	11:15	9:28
9:40	8:55	2:15	2:30	1:15	11:28
10:40	9:55	4:15	5:30	3:15	1:28
11:40	10:55	6:10***			3:28
12:40	11:55				
1:40	12:55				
2:40	1:55				
3:40	2:55				
4:40	3:55				
5:40	4:55				
	5:55				

* 6:10 p.m. Englewood bus takes all passengers for McQueen, Racetrack, Englewood, and Oregon Avenue, on most direct route possible.

** Each bus run stops at Plaza Shopping Center at twenty minutes past the hour, the first stopping at 7:20 a.m.

*** If passengers are waiting.

or destination within the city of Butte. Due to taxes, accounting, insurance, Federal Interstate Commerce Commission regulations, and low demand, out of state charter runs are not made.

The lines have a contract with the Anaconda Company to transport workers getting on and off shift in the Berkley Pit area. The run goes from the Berkley Pit to the Leach Dump. A school bus is used for this operation.

Another school bus is used to make a daily run (except Sunday) to Boulder River School and Hospital in Boulder, Montana. The bus leaves at 10:00 a.m. and returns at 5:00 p.m. The bus provides transportation for elderly people working with children in the "Foster Grandparent" program. Sponsor of this program is the Boulder Rocky Mountain Development Corporation.

Butte Bus Lines operate a state owned 1971 Ford, twenty (20) seat bus making three (3) daily trips to and from Boulder. Ridership is limited to employees living in Butte and working at the Boulder River School and Hospital. Transportation is provided to and from work at 4:35 a.m., 8:35 a.m. and 12:35 p.m. seven days weekly.

School Bus Operations

Four school buses transport high school students at 8:15 a.m. and at 3:10 p.m. on the routes shown in Figure VIII-1. High school routes begin at a distance of three miles from the high school and provide free transportation for students living outside this limit. The remaining school buses operate on the Butte Springboard Kindergarten program - funded by Model Cities.

Ridership

During the latter part of January, 1973, passengers on the Butte Bus Lines city transit lines were interviewed. Interviews were limited to passengers other than students since the entire student ridership has the same characteristics.

A total of 51 interviews were conducted during the peak periods which were determined to be from 7:30 a.m. to 8:30 a.m. and from 3:00 p.m. to 4:00 p.m.

The survey determined the following rider characteristics:

* Trip Purpose:

Work	40 percent
Shop	25 percent
Business	22 percent
Socio-Recreation	10 percent
Other	3 percent
Total	100 percent

* Forty percent of the riders with a trip purpose of Work were women. Typical employment types included maid, cook, secretary, typist, and janitoress.

* Sixty-five percent of the riders had one or more cars in the household but only twenty-seven percent had a car available as an alternate mode of transportation.

* Ridership frequency was as follows:

Ride bus daily	57 percent
1 to 2 times weekly	24 percent
1 to 4 times monthly	19 percent
Total	100 percent

* Age of riders:

5 - 19 years	14 percent
20 - 56 years	35 percent
57 - 64 years	29 percent
65 +	22 percent
Total	100 percent

* Eighteen percent of the non-student riders were men. Sixty-seven percent of the male riders were over 65 years of age.

* The total daily ridership is estimated to be 1,020 passengers per day during the school year. Adult and student ridership is 640 and 380 per day, respectively.

* Total yearly ridership is 242,900 passengers.

Income and Expenditures

Butte Bus Lines began in 1962 with fares of fifteen cents (15¢) for students and twenty-five cents (25¢) for adults. On December 1, 1968 all privately owned transit operations lost the federal fuel tax exemption. To offset this additional expense, the Butte Bus Lines requested a fare increase to twenty cents (20¢) for students and thirty cents (30¢) for adults. The lines received permission for the fare increases which took effect on November 27, 1968.

In the fall of 1969, Silver Bow County started the school busing program for students living outside the three mile radius of the high school. The resulting decline in ridership forced the company to again ask for a rate increase. On September 4, 1970, rates of twenty-five cents (25¢) for students and forty cents (40¢) for adults went into effect.

The latest rate increase was granted in June, 1973. Present fares are twenty-five cents (25) for students and fifty (50¢) for adults.

A program which subsidized senior citizen fares was started in 1972. Butte Bus Lines sells all of their adult tickets for fifty cents (50¢) each; however, tickets purchased by the Senior Citizens Headquarters are in turn sold to senior citizens at a cost of twenty-five cents (25¢).

Revenue of the Butte Bus Lines was at a peak in the fall of 1969 at which time Silver Bow County began extensive school bus operations in and around Butte. There was a corresponding drop in ridership for the private transit operation. Table VIII-3 shows that transit operations reached a peak revenue of $119,518.09 in 1969. Since 1969, the revenue from transit operations has steadily declined.

In 1969, city bus operations accounted for 84.9 percent of the revenue of the Butte Bus Lines. In 1971, city bus operations accounted for 43.2 percent of the total income. During the same period of time, charter operations increased from 10.4 percent to 53.8 percent of the total income.

Between 1965 and 1971, direct expenses to the transit operations, i.e. repairs, insurance, taxes, licenses, and wages have increased substantially (see Table VIII-3). Charter bus operations have been used to subsidize the city transit operations.

Butte Bus Lines have been successful bidders for the operation of some of the school bus routes to which they lost transit ridership.

Table VIII-3

INCOME AND EXPENSES BUTTE BUS LINES 1965 - 1972

Income	Dec. 31, 1965	Dec. 31, 1966	Dec. 31, 1967	Dec. 31, 1968	Dec. 31, 1969	Dec. 31, 1970	Dec. 31, 1971	Dec. 31, 1972
City Transit	102,546.11	112,769.94	118,627.43	112,759.81	119,518.09	106,117.57	95,975.36	92,057.80
Charter	7,563.07	5,642.07	9,115.26	13,076.60	14,603.20	29,823.12	119,733.26	83,624.08
School Buses	------	------	------	------	4,325.74	15,159.77	5,706.62	41,769.87
Advertising	1,855.50	1,642.50	1,694.66	2,034.80	2,400.00	1,480.00	960.00	640.00
Other Income	-------	------	500.00	3,500.00	------	------	------	------
Total Income	111,964.68	120,054.51	129,937.21	131,371.21	140,847.03	152,580.46	222,375.24	218,471.75
Expenses								
Repairs	6,920.59	8,033.40	6,664.80	6,377.63	7,647.33	5,780.97	13,298.72	10,734.82
Oil & Grease	1,210.93	1,113.17	1,299.84	1,422.40	1,648.32	1,847.70	1,351.21	1,333.42
Tires	3,842.68	3,430.44	5,029.53	2,174.20	4,862.30	4,047.56	7,676.81	9,638.29
Radio	------	------	348.64	400.42	115.25	194.92	363.42	373.05
Payroll	62,853.90	69,752.42	78,288.06	75,537.11	77,611.04	81,114.54	107,938.51	107,724.55
Fuel	6,795.49	7,602.49	9,471.85	8,315.09	9,199.36	11,170.29	21,093.04	21,642.36
Miscellaneous	3,055.18	2,361.06	4,745.31	2,579.62	3,521.96	3,029.60	6,361.15	4,331.42
Charter (misc)	------	105.97	279.91	354.01	933.81	1,040.33	3,966.70	2,102.68
Interest on borrowed money	1,274.54	1,048.35	983.34	2,430.02	2,555.20	2,119.32	2,245.48	2,296.73
Garage and utilities	2,347.39	1,997.61	2,950.93	2,151.48	2,524.74	2,460.98	3,482.81	3,910.12
Advertising	1,076.10	736.46	564.80	254.66	379.56	577.32	295.55	199.66
Insurance	8,234.90	9,417.02	10,899.05	12,172.17	15,116.57	14,401.34	22,000.47	25,516.41
Depreciation	5,298.09	5,568.79	6,916.69	8,483.39	8,073.33	9,062.07	10,135.03	11,742.01
Taxes, licenses	2,833.39	3,388.27	4,433.02	6,231.83	8,056.38	9,201.35	13,992.76	14,874.55
Rent	205.00	-----	-----	2,163.52	1,180.32	786.88	-----	-----
Total Expenses	105,948.18	114,555.45	132,875.77	131,047.55	143,425.47	146,835.17	214,201.66	216,420.07
Net Profit	6,016.50	5,499.06	- 2,938.42	323.66	- 2,578.44	5,745.29	8,173.58	2,051.68

At present they operate four (4) high school bus routes. The other school bus routes are operated by Ralph Olsen, Inc.

Butte Bus Lines have not invested capital on newer transit buses since 1968. The two 1956 buses purchased during that year are the newest of the buses presently being used on the transit lines. Due to the age of the transit equipment, maintenance costs have become a major expenditure. Table VIII-2 indicates that repair bills nearly doubled from $6,920.59 in 1965 to $13,298.72 in 1971.

The Butte Bus Lines have shown net profits for the years 1970-1972, but this is not due to transit operations. It is due to a substantial increase in charter bus operations. Figure VIII-2 graphically illustrates the relationship between total income and total expenditures for the Butte Bus Lines, 1965-1972.

ANALYSES OF CITY TRANSIT OPERATIONS

Expenditures for the operation of the bus company are filed for the total operation which included charter, school bus and all other operations as well as the city transit. In order to evaluate the financial status of the public transit operation, it was necessary to separate the various expenditures. Through interviews with the bus lines' accountant and the owners, estimates of expenses were assigned to each operation. Table VIII-4 shows estimated expenditures for the public transit system for the years 1971 through 1973.

In 1971, the transit operation had a loss of $5,053 due to high repair costs. Four (4) buses were operating in 1971. In 1972, the transit operation had a profit of $1,326 largely due to the extensive

Figure VIII-2

BUTTE BUS LINES INCOME AND EXPENSES

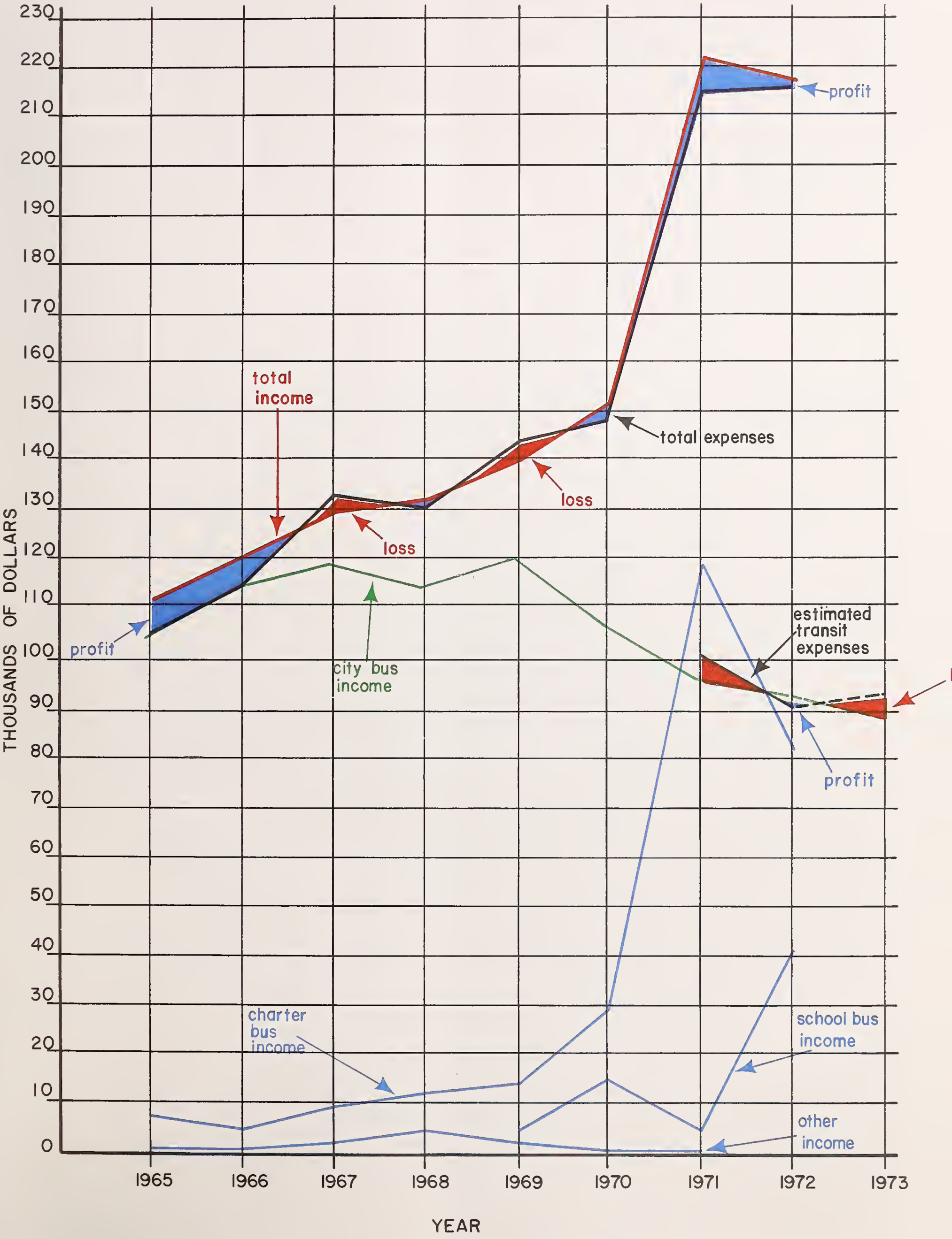


Table VIII-4

CITY TRANSIT SYSTEM

INCOME AND EXPENDITURES

	1971	1972	(Estimated) 1973	by the City**
Repairs	10,639	8,588	10,700	1,000
Oil, Grease, Tires	4,965	5,436	5,500	4,000
Fuel	11,601	10,858	10,900	8,400
Radio	363	373	---	---
Payroll	49,717	42,135	45,000	52,000***
Miscellaneous	1,750	2,000	2,000	2,000
Interest	1,347	1,607	1,600	---
Garage & Utilities	2,000	1,955	2,000	2,000
Advertising	296	200	200	2,000
Insurance	8,724	8,285	8,300	8,800
Depreciation	4,586	4,000	4,000	8,000
Tax & Licenses	6,000	5,935	6,000	4,000
Total Expenses	101,988	91,372	96,200	92,200
Total Revenue	96,935	92,698	92,365*	92,365
Profit	---	+1,326	---	+ 165
Loss	- 5,053	---	-3,835	---

---

* Assuming ridership drops two percent due to fare increase.

** Assuming new equipment with old buses used for backup and stub runs.

*** Includes management fees.

repairs done in 1971. The operation was reduced to three (3) buses. Based on past operation and income and expenditures to date, it is estimated that the transit operation will have a loss of $3,835 by the end of 1973. (See Table VIII-4 and Figure VIII-2).

Future Operation

Table VIII-4 shows estimates for both private and city operation of the transit system. Continued use of the present buses, which are seventeen (17) years old will result in increasing repair costs.

Ridership is stabilized and is not expected to fluctuate drastically as long as the present level of service is maintained.

The result will be a fixed income with increasing costs which will result in a steadily increasing loss for the transit operation.

Recommendations

Recommendations for future action by the private operator or local governmental officials are based on the following factors:

- The existing equipment is old and in poor condition.
- Revenue is not sufficient to finance new equipment.
- Ridership is stabilized, made up primarily of captive riders who depend on the transit for their only mode of transportation.
- The present level of service is sufficient to meet most riders' needs.
- The private operator cannot continue to absorb increasing losses, supporting the city transit with other operations.
- The citizens of Butte must decide whether the transit system

is to be subsidized so it can continue to operate or if it is to be discontinued. Once discontinued, it will be difficult to re-establish the system.

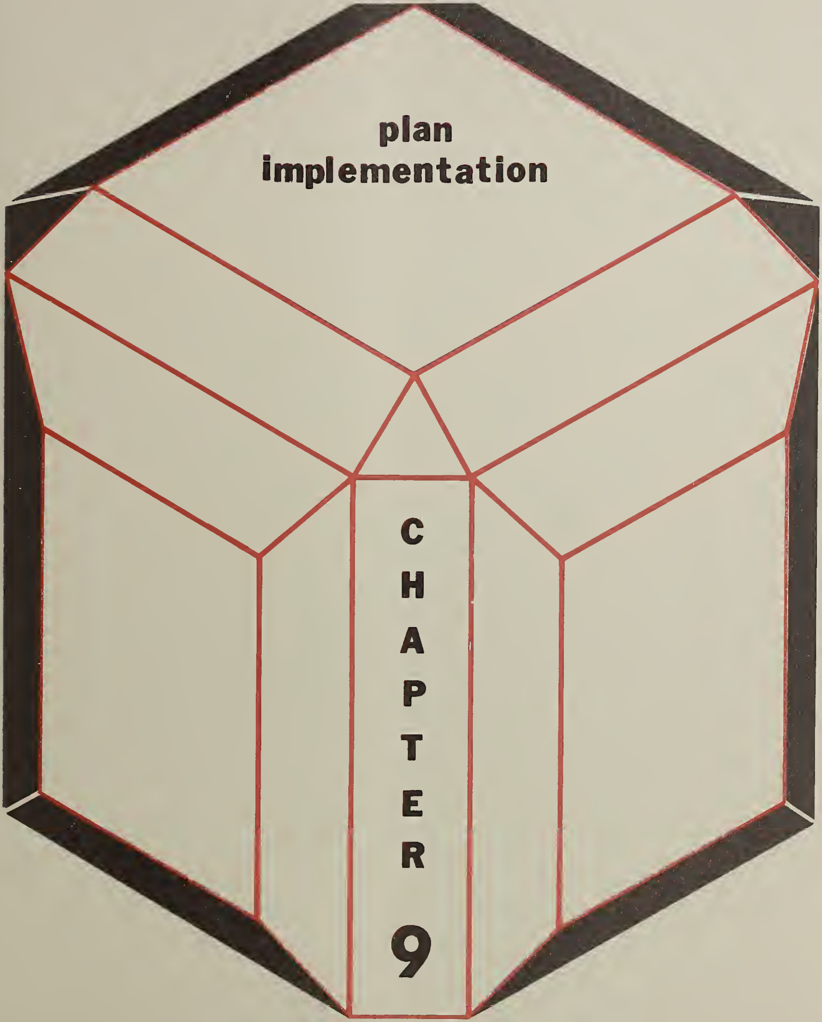
It is recommended that the following steps be taken:

1. Local officials contact the Urban Mass Transit Administration (UMTA) of the U. S. Department of Transportation to determine the availability of funds for aid to the city transit system.

2. If funds are available, they will be on a matching basis which requires the City to make application. The City will be required to acquire the city transit operation.

3. With assistance from the Urban Mass Transit Administration, an application for a capital grant should be made, sufficient to cover the following items:
    a. purchase a minimum of two (2) and preferrably three (3) new thirty passenger buses.
    b. acquire the present owners assets in the city transit system.
    c. contruct a garage and maintenance shop.

4. If these capital expenditures are made, the city transit system can be operated on a break-even basis. If no action is taken by the City, the private operator will be forced to discontinue service.



plan implementation

CHAPTER 9

Chapter IX

PLAN IMPLEMENTATION

The foregoing chapters of this report have been concerned primarily with the development of a transportation plan which will meet future travel needs in a systematic manner, rather than on a crisis basis. Chapter VI outlined recommended propiects and priorities in five year increments from 1970 through 1990.

The purpose of this chapter is to set forth general sources of funding and to discuss the need for establishing a continuing planning process.

FUNDING SOURCES

The major constraint controlling the implementation of the Transportation Plan will be the availability of funds.

There are four (4) sources of funds available for construction of the recommended improvements: federal, state, county and city.

Federal funds are derived from highway user taxes. It is not possible to plan on a definite amount available from this source. As of writing of this report, the Federal Highway Act of 1973 which apportions federal funds for fiscal years 1974 and 1975 has just been passed by Congress and signed by the President. However, there is no guarantee that Montana will receive the funds allocated by the Act.

At present, nearly 47 million dollars in federal funds allocated for Montana are being withheld. For these reasons, no attempt is made here to estimate federal funds that will be available to the Butte urban area for highway improvements.

State funds for highway construction come from a seven (7) cent tax on gasoline and a nine (9) cent tax on diesel fuel which is used on public highways or for highway construction. The total net receipts from these sources for the year ending July 1, 1973, were $33,516,000.

In accordance with the State Financial District Law, Federal Funds available at the beginning of each fiscal year for each of the various highway systems are matched with state funds and these State Funds are then allocated to the various financial districts, counties and cities. For fiscal year 1972 and 1973 the following state funds were allocated to systems which were in the Butte Urban Area:

Table IX-1

STATE FUNDING ALLOCATIONS - FISCAL YEARS 1972 AND 1973

	1972	1973
Interstate System - Financial District 9 (Beaverhead, Deer Lodge, Madison and Silver Bow Counties)	$959,452.33	$566,517.04
Primary System - Financial District 9 (Beaverhead, Deer Lodge, Madison and Silver Bow Counties)	375,776.16	336,771.16
Secondary System - Silver Bow County	70,243.55	53,027.92
Urban Extensions of Primary and Secondary Routes - Butte	32,956.47	32,554.55
Urban Topics	13,797.28	9,579.95

State funds allocated in the foregoing tabulation represent approximately 9 percent of the available construction funds on the Interstate System and 34 percent on the other Federal Aid Systems.

The Federal Aid Highway Act of 1973 which was recently signed by the President has many new programs and many changes in previous programs. When the federal apportionments for each of the programs included in the new act are made known to Montana there could be significant differences in the amounts available for federal aid construction in the Butte urban are over what has been available in the past.

During 1972 and 1973 the City of Butte and Silver Bow County received approximately $90,000 amd $33,000 per year, respectively, from State gas tax revenues. Acting together the two jurisdictions can presently expect about $123,000 in Montana gas tax funds. During the twenty year period, 1970-1990, this amounts to $2,460,000. Up to 50 percent of these monies may be used for maintenance, the remaining must be allocated to design and construction.

Additional revenues are available to Silver Bow County, derived from the gross vehicle weight tax, registration fees, federal funds, and property assessments.

Other city revenue sources for highway construction, improvement and maintenance, comes from property taxes, auto registration fees, highway user taxes and federal revenue sharing funds.

As stated at the beginning of this chapter, the availability of federal funds, for both highway improvements and general revenue sharing, makes it impossible to predict future funds available over a period of time.

Cost estimates shown in Chapter VI provide estimates of the amount of funds needed, the phasing of construction of the various recommendations will be contingent upon future funding policies.

CONTINUING STUDY

Due to impending major changes in the land use patterns of the Butte urban area, it is particularly important that a continuing planning process be established and followed to periodically update this transportation plan.

The continuing planning process should be a joint effort of the local planning staff, the Montana Department of Highways and the Federal Highway Administration.

The local planning staff should provide the input of periodically updated statistics relating to the area's economy, population and land use.

The Montana Department of Highways and the Federal Highway Administration will have the responsibility of conducting future travel surveys, Measuring future use of the system and evaluating the effectiveness of future improvements.

Through these joint efforts, future development of the Butte urban area can be coordinated to achieve the established community goals and objectives.

"All is flux, nothing stays still......nothing endures but change."

Heraclitus

appendix

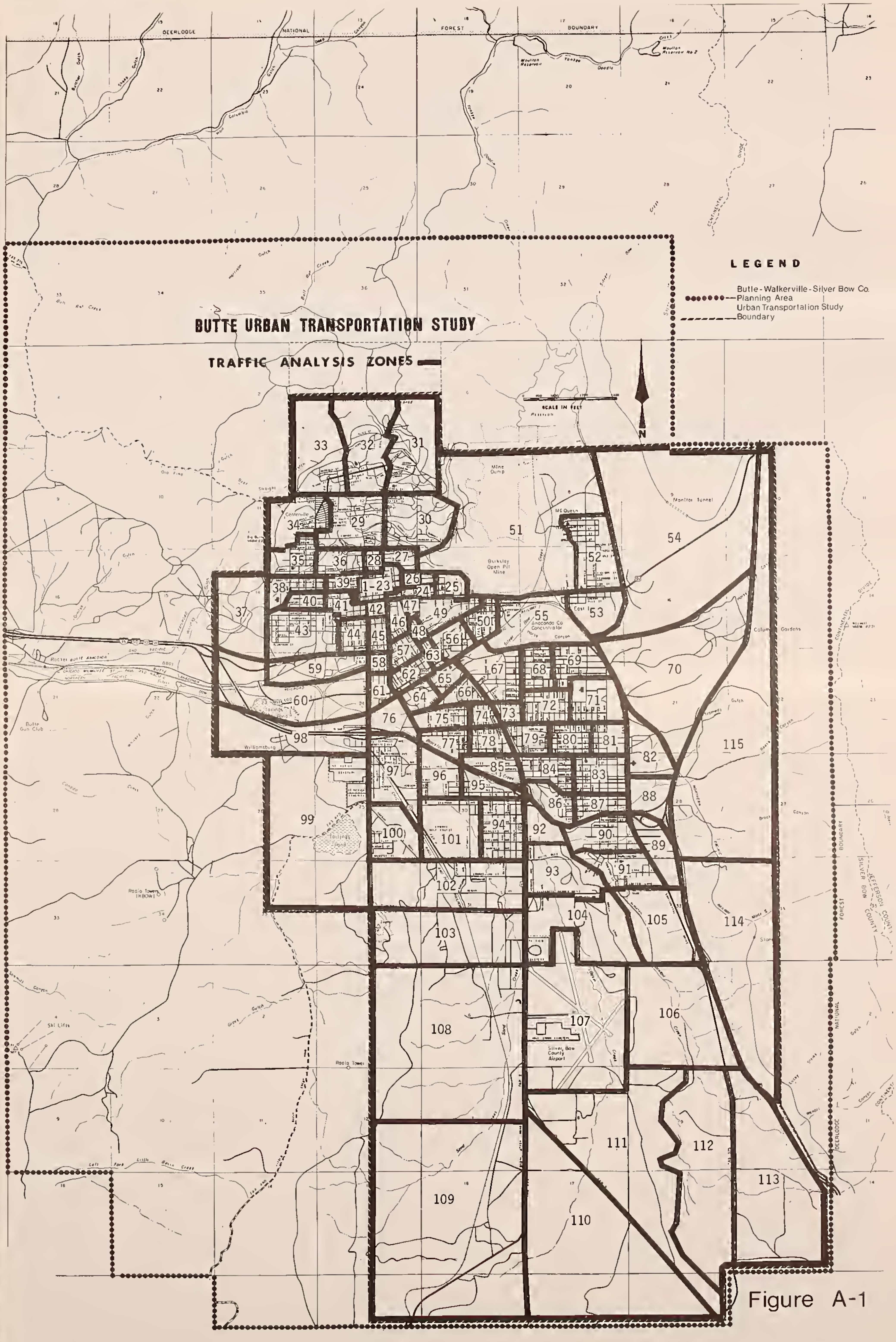
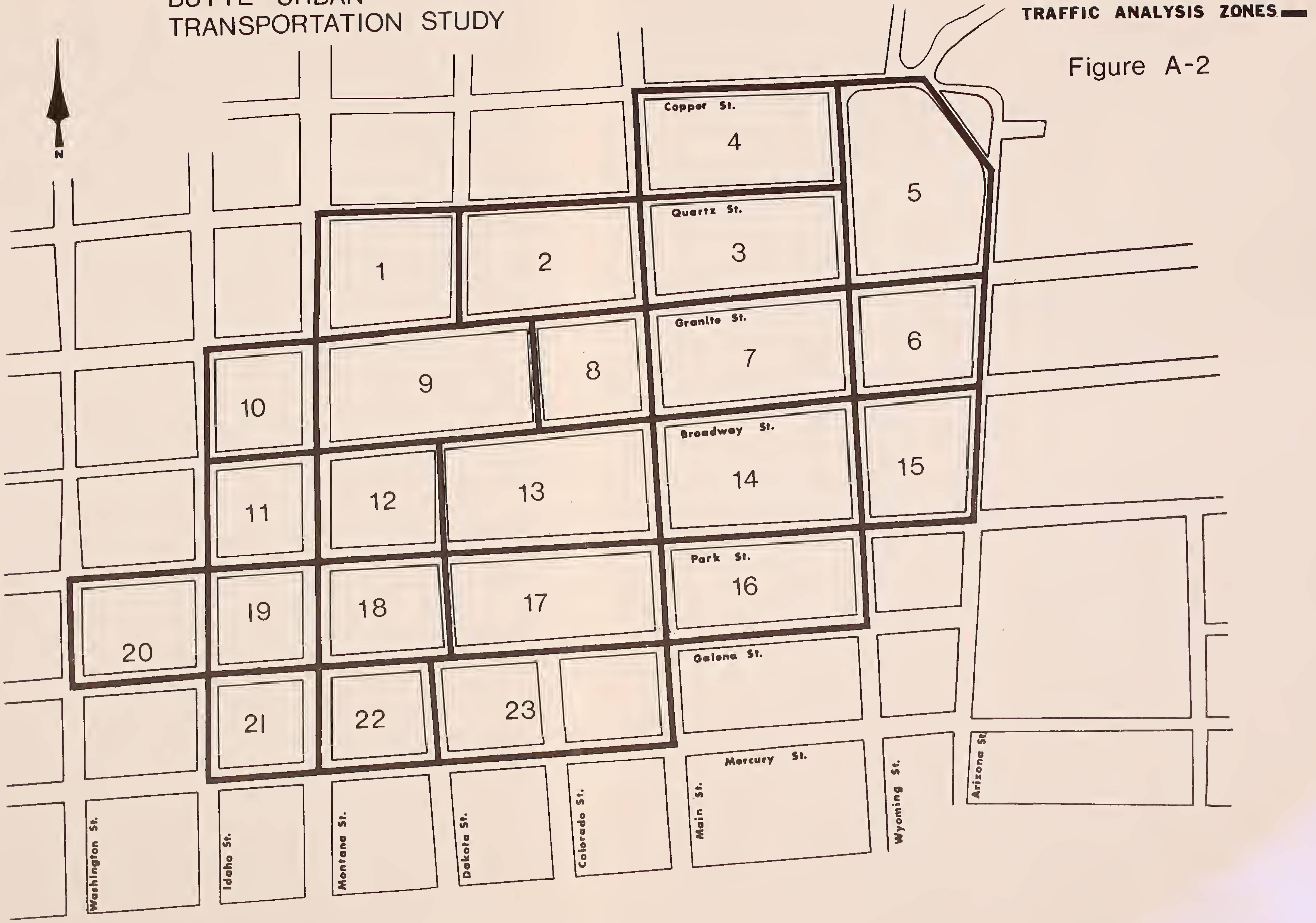


Figure A-1

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

BUTTE URBAN TRANSPORTATION STUDY

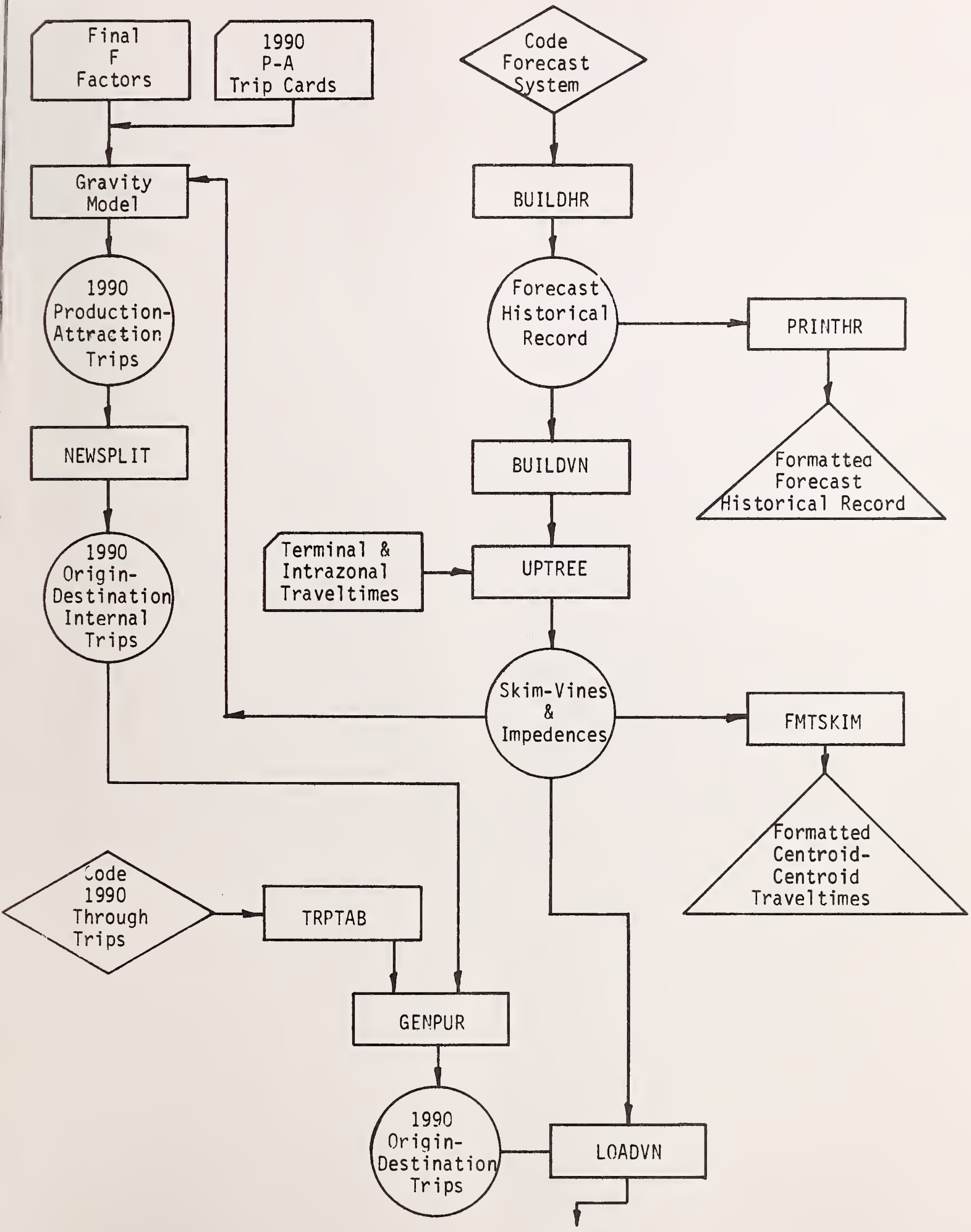


TRAFFIC ANALYSIS ZONES ▬

Figure A-2

FIGURE A-3

TRAFFIC ASSIGNMENT - FORECAST SYSTEMS


Final F Factors
1990 P-A Trip Cards
Code Forecast System
Gravity Model
BUILDHR
1990 Production-Attraction Trips
Forecast Historical Record
PRINTHR
NEWSPLIT
BUILDVN
Formatted Forecast Historical Record
1990 Origin-Destination Internal Trips
Terminal & Intrazonal Traveltimes
UPTREE
Skim-Vines & Impedences
FMTSKIM
Formatted Centroid-Centroid Traveltimes
Code 1990 Through Trips
TRPTAB
GENPUR
1990 Origin-Destination Trips
LOADVN

(Continued)

FIGURE A-3

TRAFFIC ASSIGNMENT - FORECAST SYSTEMS (CONTINUED)

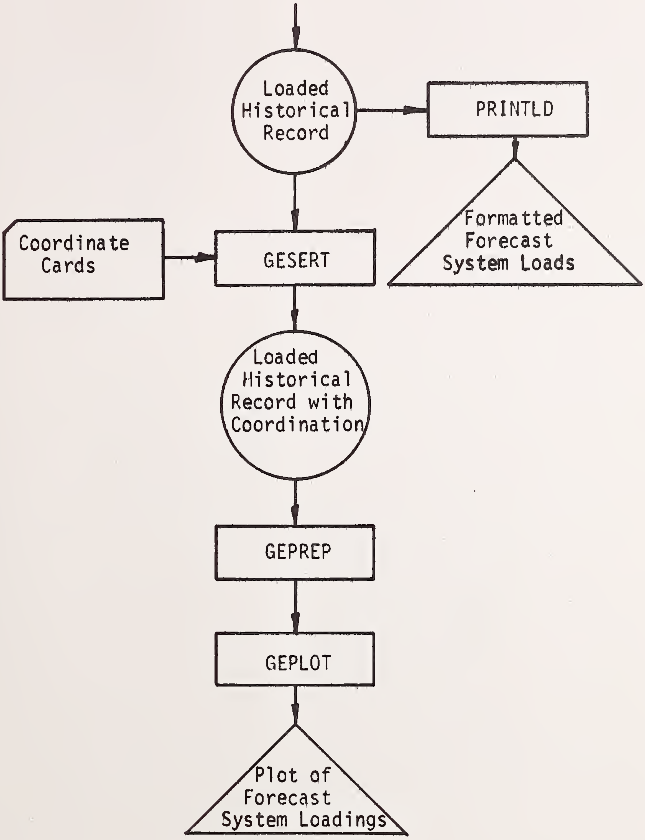
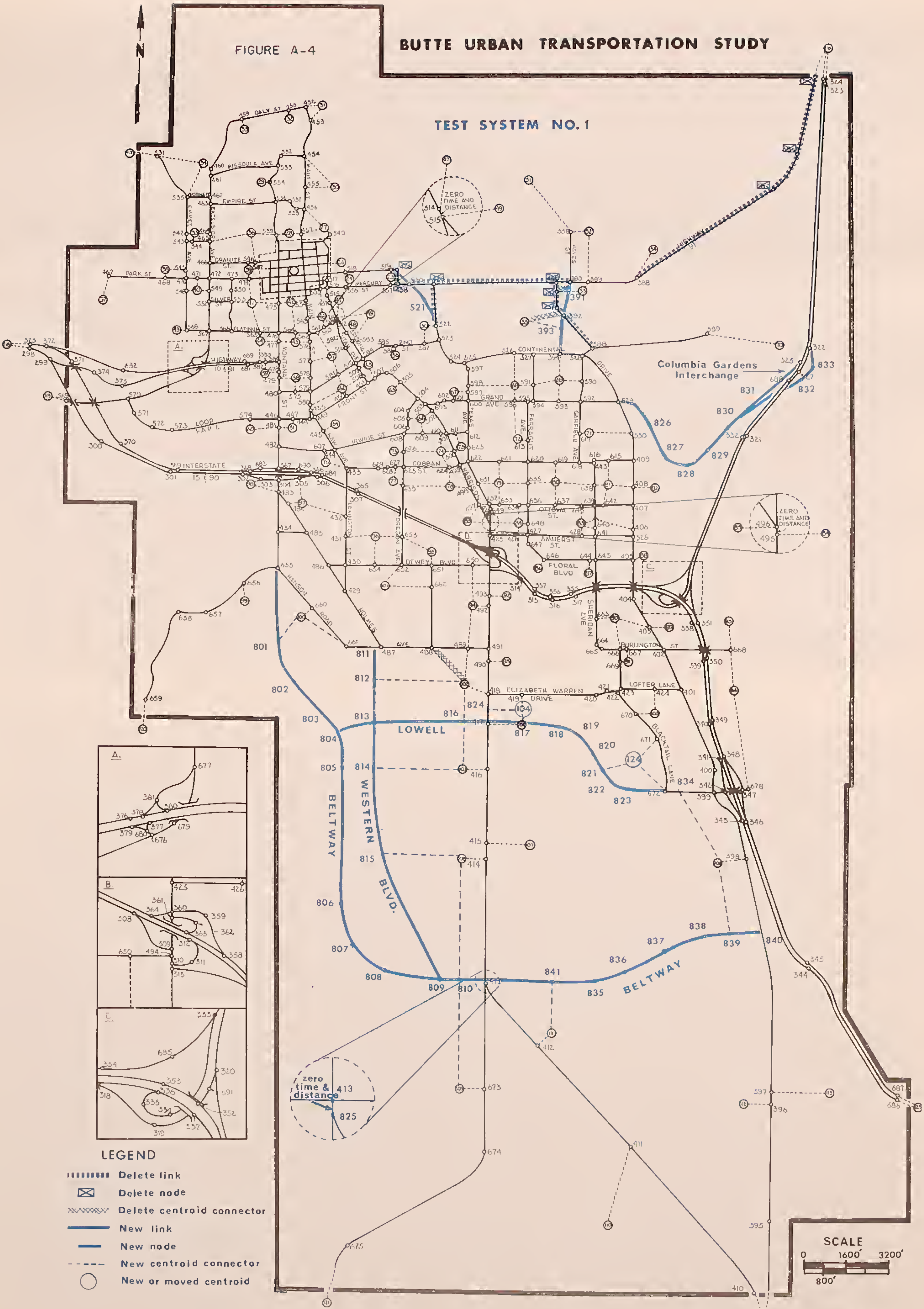

Loaded Historical Record
PRINTLD
Formatted Forecast System Loads
Coordinate Cards
GESERT
Loaded Historical Record with Coordination
GEPREP
GEPLOT
Plot of Forecast System Loadings

FIGURE A-4

BUTTE URBAN TRANSPORTATION STUDY

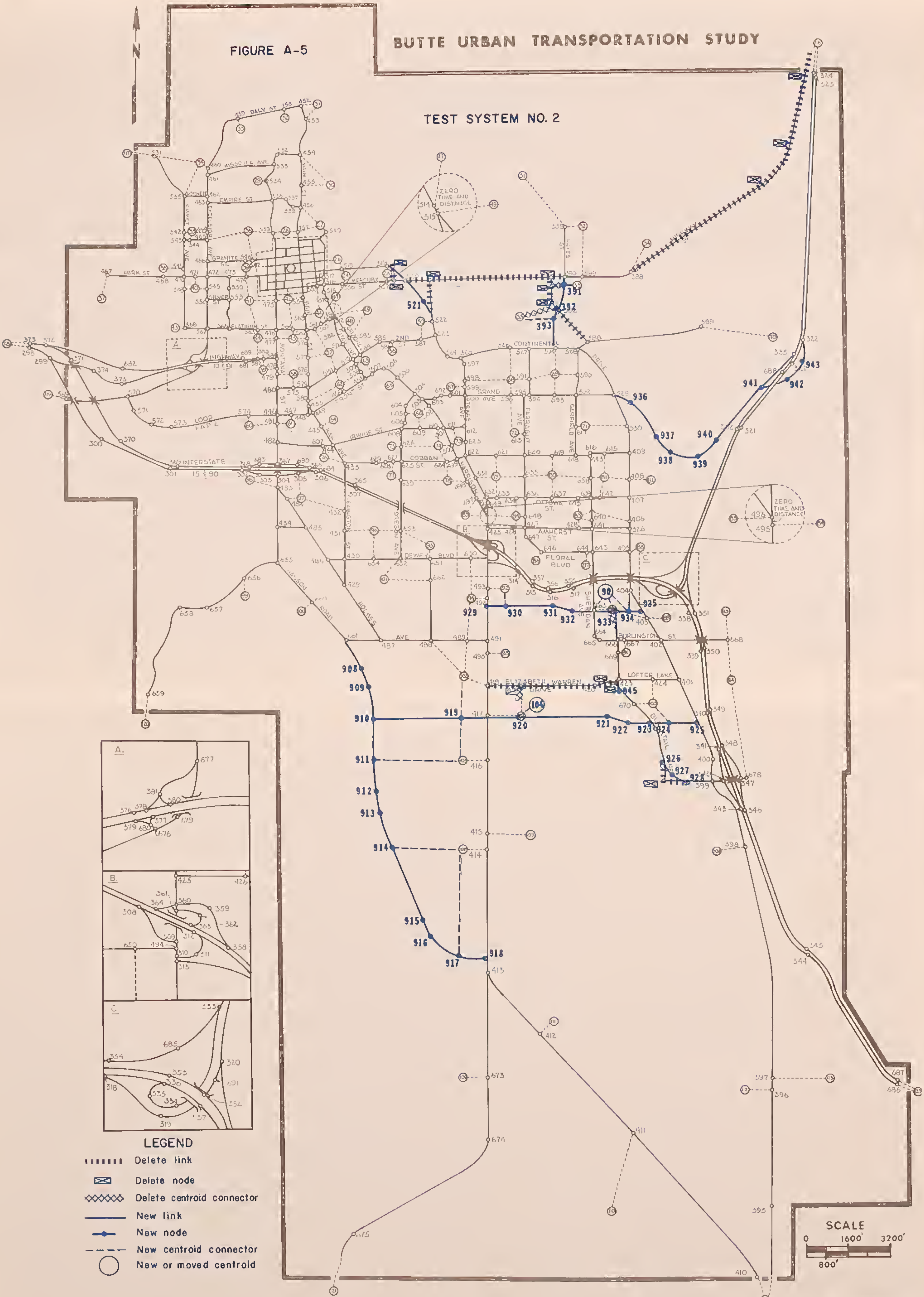
TEST SYSTEM NO. 1



CLETE DAILY AND ASSOCIATES
Helena, Montana

FIGURE A-5

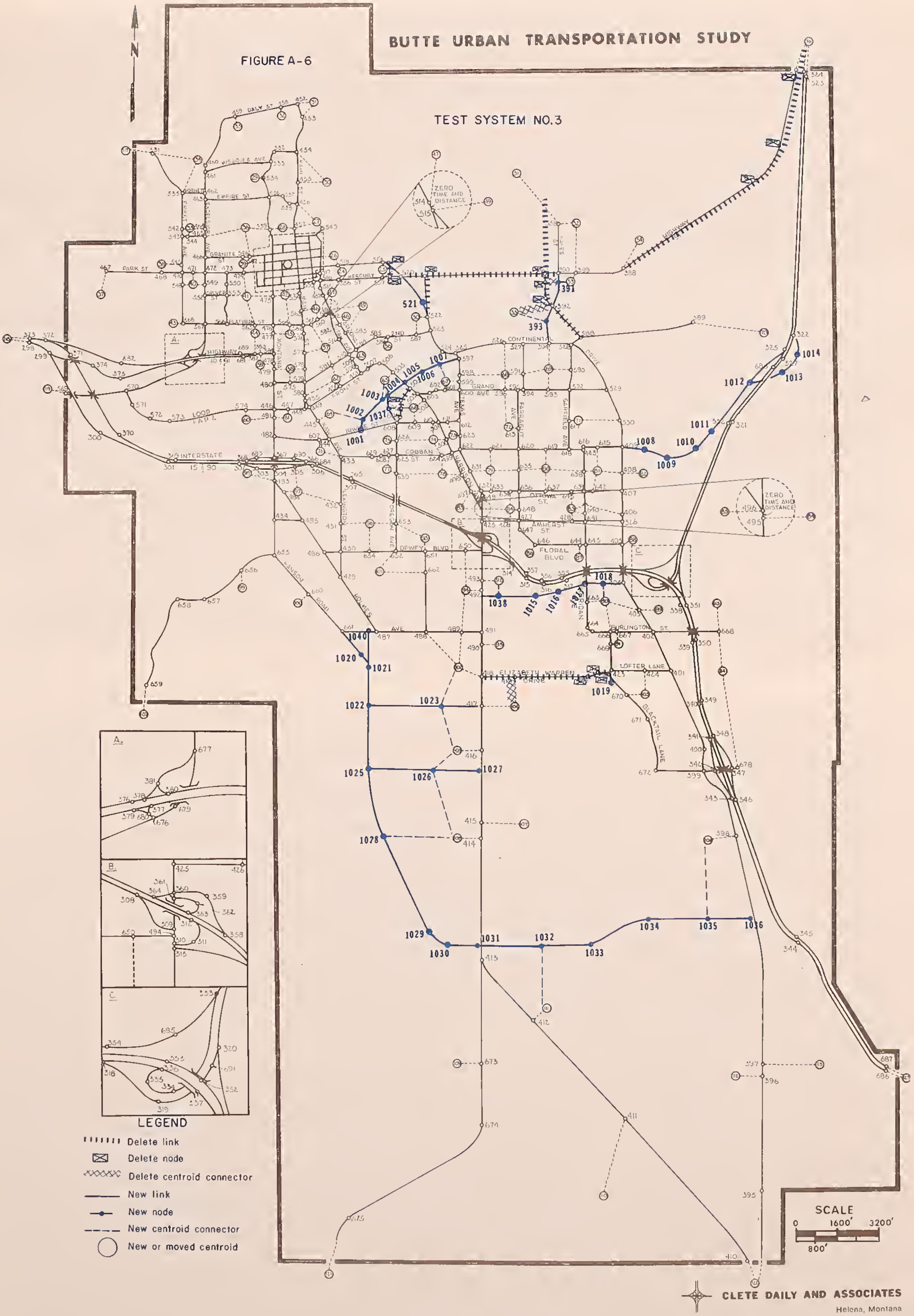
BUTTE URBAN TRANSPORTATION STUDY



LEGEND

- Delete link
- Delete node
- Delete centroid connector
- New link
- New node
- New centroid connector
- New or moved centroid

CLETE DAILY AND ASSOCIATES
Helena, Montana



BUTTE URBAN TRANSPORTATION STUDY

FIGURE A-6

TEST SYSTEM NO. 3

CLETE DAILY AND ASSOCIATES
Helena, Montana

Table A-1

TRAFFIC SIGNAL INVENTORY

Intersection	Manufacturer	Type	Operation	No. of Dials	Model No.	Equip. Age	Approach Direction	Number of Signal Indications	Remarks
Montana & Granite Major - Granite Minor - Montana	Crouse-Hinds	Fixed time	2 phase	1	KS	1960	Southbound	1	Single dial Capability
							Northbound	1	
							Eastbound	1	
							Westbound	1	
Granite & Main Major - Main Minor - Granite	Econolite	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1970	Southbound	2	
							Northbound	2	
							Eastbound	2	
							Westbound	2	
Granite & Wyoming Major - Granite Minor - Wyoming	Crouse-Hinds	Fixed time	2 phase	1	KS2	1962	Southbound	1	Single dial Capability
							Northbound	1	
							Eastbound	1	
							Westbound	1	
Montana & Broadway Major - Montana Minor - Broadway	General Electric	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1962	Southbound	2	Three dial Capability
							Northbound	2	
							Eastbound	2	
							Westbound	2	
Main & Broadway Major - Main Minor - Broadway	Econolite	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1970	Southbound	2	
							Northbound	2	
							Eastbound	2	
							Westbound	2	
Wyoming & Broadway Major - Wyoming Minor - Broadway	General Electric	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1962	Southbound	2	Three dial Capability
							Northbound	2	
							Eastbound	2	
							Westbound	2	
Arizona & Broadway Major - Arizona Minor - Broadway	General Electric	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1962	Southbound	2	Three dial Capability
							Northbound	2	
							Eastbound	2	
							Westbound	2	

Table A-1 (continued)

TRAFFIC SIGNAL INVENTORY

Intersection	Manufacturer	Type	Operation	No. of Dials	Model No.	Equip. Age	Approach Direction	Number of Signal Indications	Remarks
Park & Excelsior Major - Excelsior Minor - Park	Crouse-Hinds	Fixed Time	2 phase	1	KS2	1962	Southbound Northbound Eastbound Westbound	1 1 1 1	
Park & Washington Major - Park Minor - Washington	General Electric	Fixed time	2 phase	1	2TTD	1955	Southbound Northbound Eastbound Westbound	1 1 1 1	Single Dial Capability
Park & Idaho Major - Park Minor - Idaho	General Electric	Fixed time	2 phase	1	2TTD	1955	Southbound Northbound Eastbound Westbound	1 1 1 1	Single Dial Capability
Montana & Park Major - Montana Minor - Park	Marbelite	Fixed time Pedestrian Lights	3 phase	3	M60	1970	Southbound Northbound Eastbound	3 2 3	Plus 1indication for left turn green arrow
Park & Dakota Major - Park Minor - Dakota	Econolite	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1970	Southbound Eastbound	2 3	
Park (between Dakota & Main)	Econolite	Pedestrian actuated	2 phase	3	2TTFI	1970	Eastbound	3	
Park & Main Major - Park Minor - Main	Econolite	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1970	Southbound Northbound Eastbound	2 2 3	
Park & Wyoming Major - Park Minor - Wyoming	Econolite	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1970	Southbound Northbound Eastbound	2 2 3	

Table A-1 (continued)

TRAFFIC SIGNAL INVENTORY

Intersection	Manufacturer	Type	Operation	No. of Dials	Model No.	Equip. Age	Approach Direction	Number of Signal Indications	Remarks
Park and Arizona Major - Arizona Minor - Park	Econolite	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1970	Southbound Northbound Eastbound Westbound	2 2 3 2	
Montana & Galena Major - Montana Minor - Galena	Marbelite	Fixed time Pedestrian Lights	2 phase	3	M60	1970	Southbound Northbound Eastbound Westbound	2 2 2 3	
Main & Galena Major - Main Minor - Galena	Econolite	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1970	Southbound Northbound Westbound	2 2 3	
Montana & Mercury Major - Montana Minor - Mercury	Marbelite	Fixed time Pedestrian Lights	2 phase	3	M60	1970	Southbound Northbound Eastbound Westbound	2 2 2 2	
Main & Mercury Major - Main Minor - Mercury	Crouse-Hinds	Fixed time	2 phase	1	KS2	1962	Southbound Northbound Eastbound Westbound	1 1 1 1	Single Dial Capability
Arizona & Mercury	Econolite	Fixed time Pedestrian Lights	2 phase	3	2TTFI	1970	Southbound Northbound Eastbound Westbound	2 2 2 2	
Montana & Platinum Major - Montana Minor - Platinum	Traff-O-Matic	Semi-Actuated Pedestrian Lights	2 phase		SM10	1970	Southbound Northbound Eastbound Westbound	2 2 2 2	

Table A-1 (continued)

TRAFFIC SIGNAL INVENTORY

Intersection	Manufacturer	Type	Operation	No. of Dials	Model No.	Equip. Age	Approach Direction	Number of Signal Indications	Remarks
Platinum & Main Major - Main Minor - Platinum	Crouse-Hinds	Fixed time	2 phase	1	KS	1960	Southbound Northbound Eastbound Westbound	1 1 1 1	Single dial Capability
Arizona, Utah & Platinum Major - Arizona Minor - Platinum	Econolite	Full - Actuation Pedestrian Lights	2 phase		D2006	1970	Southbound Northbound Eastbound Westbound Northwestbound	2 2 2 2 2	
Montana & Iron Major - Montana Minor - Iron	Traff-O-Matic	Semi-Actuated Pedestrian Lights	2 phase		SM10	1970	Southbound Northbound Eastbound Westbound	2 2 3 2	
Second & Main Major - Main Minor - Second	Econolite	Fixed time	2 phase	1	2TTFI	1960	Southbound Northbound Eastbound Westbound	1 1 1 1	Three dial Capability
Utah & Second Major - Utah Minor - Second	Econolite	Semi-Actuated with Pedestrian Lights	2 phase		D2004	1970	Southbound Northbound Eastbound Westbound	2 2 2 2	
Montana & Front Major - Montana Minor - Front	Traff-O-Matic	Semi-Actuated with Pedestrian Lights	3 phase		SM10	1970	Southbound Northbound Eastbound Westbound	 2 2 2	2 for A & C phase; 1 for C phase
Kaw & Front Major - Minor -	Econolite	Full Actuation Pedestrian Lights	2 phase		D2006	1970	Southbound Northbound Eastbound Westbound	2 2 2 2	

Table A-1 (continued)

TRAFFIC SIGNAL INVENTORY

Intersection	Manufacturer	Type	Operation	No. of Dials	Model No.	Equip. Age	Approach Direction	Number of Signal Indications	Remarks
Utah & Front Major - Front Minor - Utah	Econolite	Full Actuation Pedestrian Lights	2 phase		D2006	1970	Southbound Northbound Eastbound Westbound	2 1 2 3	2 - A phase & 1 - A + B phase
Grand & Harrison Major - Harrison Minor - Grand	Econolite	Full Actuation Pedestrian Lights	3 phase 1-Vehicle Module 2-Vehicle + Pedestrian Module		D4302	1970	Southeastbound Northwestbound Westbound	4 2 2	2 - A phase & 2 - A + B phase 2 - B phase 1 - C phase & 1 - C + A phase
Harrison & George Major - Harrison Minor - George	Econolite	Semi-Actuated; Pedestrian Lights	2 phase		D2004	1970	Southeastbound Northwestbound Eastbound Westbound	2 2 2 2	
Harrison & Cobban Major - Harrison Minor - Cobban	Econolite	Semi-Actuated; Pedestrian Lights	2 phase		D2004	1970	Southeastbound Northwestbound Eastbound Westbound	2 2 2 2	
Amherst & Harrison Major - Amherst Minor - Harrison	Econolite	Semi-Actuated; Pedestrian Lights	2 phase		D2004	1970	Southbound Northbound Westbound	2 2 2	
Harrison & Dewey Major - Harrison Minor - Dewey		Semi-Actuated; Pedestrian Lights	2 phase		D2004	1970	Southbound Northbound Eastbound	2 2 2	
Excelsior & Caledonia Major - Excelsior Minor - Caledonia	Crouse-Hinds	Fixed time	2 phase	1	KS	1960	Southbound Northbound Eastbound Westbound	1 1 1 1	One dial Capability

Table A-1 (continued)

TRAFFIC SIGNAL INVENTORY

Intersection	Manufacturer	Type	Operation	No. of Dials	Model No.	Equip. Age	Approach Direction	Number of Signal Indications	Remarks
Continental Drive & U. S. 91	Econolite	Full Actuation	3 phase		D4300		Southbound	2	
							Eastbound	2	1 - Phase B left Turn Green Arrow
							Westbound	2	
Harrison & Civic Center	Crouse-Hinds	Fixed time	2 phase	1	KS	1960	Southbound	2	Part-time cycle for Civic Center Flashing when no Civic Center Activity.
							Northbound	2	
							Eastbound	2	
							Westbound	2	
Cobban & Florence		Flasher; 5 way stop	-------	-----	-----	1960	Southbound	1	
							Northbound	1	
							Eastbound	1	
							Westbound	1	
							Southwestbound	1	
Mercury & Ohio		Flasher; 4 way stop	-------	-----	-----	1960	Westbound	1	
							Southbound	1	
							Northbound	1	
							Eastbound	1	
Excelsior & Platinum		Flasher; 4 way stop	-------	-----	-----	1960	Southbound	1	Yellow to Excelsior
							Northbound	1	
							Eastbound	1	
							Westbound	1	
Second & Arizona		Flasher; 4 way stop	-------	-----	-----	1960	Southbound	1	
							Northbound	1	
							Eastbound	1	
							Westbound	1	
Main & Woolman		Flasher; 2 way stop	--------	-----	-----	1960	Southbound	1	Yellow to Main
							Northbound	1	
							Eastbound	1	
							Westbound	1	

Table A-1 (continued)

TRAFFIC SIGNAL INVENTORY

Intersection	Manufacturer	Type	Operation	No. of Dials	Model No.	Equip. Age	Approach Direction	Number of Signal Indications	Remarks
Harrison & Harvard		Flasher; 2 way stop	---------	-----	-----	1960	Southbound	1	Yellow to Harvard
							Northbound	1	
							Eastbound	1	
							Westbound	1	
Second & Emma		Flasher; 4 way stop	---------	-----	-----	1960	Southbound	1	
							Northbound	1	
							Westbound	1	
							Eastbound	1	

Table A-2
Butte Urban Transportation Study
1990 Total Origin and Destination Trips

Zone of Destination

Zone of Origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	29	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	
1	8	7	1	1	1		5	8	7	4	6	5	6	30	3	1	19	1	3	1	1	1	9		1		4	10	6	11	7	6	4	12	21	19	3	31	33	10	24	1	28	16	18	13	6	3	1		4	3	1		3	6	10	4	5	4	3	13	5	3	1
2	9	9	2	1	1		7	10	6	6	9	5	2	30	3	1	19	4	2	2	1	2	1		1		5	6	6	14	9	5	4	9	15	18	3	29	26	7	18	1	23	10	11	11	5	4	1	1	2	2	1	1	2	6	9	4	4	5	5	8	7	1	2
3		1	1	1					1	1				2			2					1	1					4	4	4				1	2		1	3	2	2	3		2	2		1	3										1			1	1	3			3
4										1				2									1				1	1				1		1	1	1		2	1	1	2		2	1		2											1	1	1			1			4
5		1					2		1	1	2		1	3	4		1				1	1			1			4	2		1		2	2	2	1		6	1	2	3		5	1	2	2	1				1		1				2		1	1	1	2	1		5
6								1				1		4	4		2							1				1	1			1			1	1	2	2	2		1		2	1	1	2										1			1			3		1	6
7	5	7	1			2	1	7	3	5	8	4	9	12	3		15	2		1	4	4	4	2			4	10	5	16	6	7	8	13	20	18	6	41	31	9	38	2	39	13	16	9	11	1	1		3	1	1		1	7	13	6	3	4	4	13	5	4	7
8	10	9		2		1	6	9	7	6	9	6	6	32	4		21	3	2	2	1		9	2	1		5	3	3	15	5	8	4	10	19	14	5	28	32	7	24	1	27	12	13	14	9	2	2		4	3	2		2	8	12	5	6	3	6	15	6	3	8
9	6	7				1	4	8	5	[illegible]	7	5	5	24	3		14	2	3	1	1	4	2	2	1		6	6	4	9	5	3	4	8	13	13	3	18	26	6	14	1	20	11	11	9	3	2	1	1	3	3	2		1	4	8	4	3	2	7	8	4	2	9
10	4	6				1	4	6	4	3	5	2	2	19	2		10	3	2	1		1	2				3	3	3	6	1	1	1	4	9	5	2	11	13	3	10	1	10	6	4	7	3		1	1	2		1			2	2	2	4	1	1	4	2	2	10
11	8	10		1		1	7	8	8	4	6	6	6	27	4		16	3	3	3		2	3		1		3	5	5	6	4	4	4	7	15	12	2	23	30	7	19	3	20	11	11	11	3	2	1	1	4	1	1	1	2	5	8	3	5	2	5	8	3	3	11
12	5	6	1				4	7	5	1	6	2	4	18	2		11	1	2	2	1	1	1		1	2	1	4	2	6	3	5	1	6	9	10	3	17	19	4	15		17	10	6	8	3	2	2	1	2	1	1		2	4	5	3	4	1	3	7	2	5	12
13	6	7					3	7	5	5	5	4	4	20	2		11	2	2	1		2	1			1	2	6	6	7	4	4	2	6	13	9	1	19	20	6	15	1	18	10	10	9	6	2	2		3	1	1		1	6	6	4	3	4	3	10	4	1	13
14	36	31	2	2	4	1	13	32	23	18	28	18	19	94	13	2	61	8	6	6	9	4	12	5	2	3	15	21	15	42	17	18	16	30	52	40	14	93	80	28	77	7	88	38	56	50	35	9	4	2	14	9	5	2	8	19	38	14	19	15	15	49	15	13	14
15	4	5					1	5	4	2	3	5		13	3		9	1		1		4	2		2		2	2	4	1	3	5	1	4	9	6	1	13	13	2	12	1	14	4	9	9	5	2			3	1	1		1	3	8	2	3	1	3	6	5	3	15
16								1	2			1		2			3									1				1	1	1		2	1	2	1	3	3		3		3	2	2	2		1			1						1	1	2					1	16
17	21	14	1	1	4		14	22	13	10	18	12	10	54	4	1	33	5	6	3	1	4	5	1	3	1	1	1	3	22	3	8	10	15	30	24	6	44	51	15	41	4	42	26	29	28	13	4	3		8	6	2	2	4	9	20	9	11	5	9	26	8	9	17
18	1						1	3	1	3	3		2	4			5		2				1			2		2	4	1	3	3	2	5	8	6	1	14	14	3	11	2	11	7	10	4	3	1			1				1	2	5	2	2	1	4	4	1	1	18
19	1			1			1	1	2				2	8	1		3	1	1				1					3	2		2	2	2	3	6	7	2	9	14	4	9	7	9	7	8	4	1	1			1		1	1		3	3	2	2	1	1	6		2	19
20	1						1	2	2		3	4		4			4		1	1			1				3	2	1	3	3	2	2	4	10	5	3	12	16	5	10		9	7	6	3	3					1				3	4	2	1	1	2	3	1	2	20
21							1	2	1		3			4			3	1								1			1	1		1	1		1	1		1	4		2	1	4	3			3										2			1		2		1	21
22			1				1		1		2			4			1		1							1		4		1	1	1			2	2		2	3		2		1	2	3	2										1	1				1	1	1		22
23	4					1	5	4	2	3	1	1	2	13			6	1	2	1			1	1		1	1	1	4	5	2	2	1	4	5	1	2	7	7	1	8	1	9	4	6	5	3	1		1	1	1			2	1	4	1	3	1	1	5	2		23
24							1	1	1		1			4			2					4		1	1	1	2	3		3		1	1	1	3	2	1	3	7	1	5	1	4	3	4	4	3	2	1		3		1		1	3	3	4		1	2	3	1	1	24
25								1			1	4					1				1			1	1		1	4		2	1	1	1		3	2		1	6	2	1		4	3	2	2	2	1	1		1	1			1	3	1	1	1	1		1	2	1	25
26							1	1			1						1		1		3		1		1	2	3	1	2	3	2			2	3	1	1	3	4		4	1	4	1	2	2	1	1	1		2				2	2	1	2	1		1	3			26
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28	9				1		10	8	5	3	6	3	5	21			9	3	3	2		4	2	1		1	14	4	10	21	6	7	1	9	12	21	1	24	29	6	16	1	20	11	10	16	6	2	3		3	2	1		3	2	8	4	7	3	4	9	3	4	28
29	7				2		6	5	6	3	3	3	1	15		2	9	3	1	1		1	1	1		3	3	8	8	26	9	10	5	15	18	15	2	20	27	4	14	3	17	7	8	14	3	3	1		2	4	1	1	3	2	7	3	5	3	3	8	1	3	29
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31	5		4			2	7	5	3	3	6	8		17	4		8	3	1	3	1	1	1		2		11	6	10	[illegible]	13		10	21	17	7	3	24	16	5	15	1	18	8	5	21	3	2	2	2	4	3	2		4	5	6	2	7	3	6	8	4	5	31
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33	4						9	2	5	3	1	3		12	1	1	9	3	2	2			2		1	1	1	2	1	20	11	10	6	13	19	6	2	21	16	5	10	1	16	5	2	13	2	2	4		1	3	1		1	4	4	3	2	4	2	6	4	3	33
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35	20	[illegible]	1	3	1	2	22	18	12	9	13	9	12	52	10	2	30	8	6	10	3		5	3	3	1	13	14	17	39	15		18	52	76	53	18	195	88	27	50	3	160	26	18	50	8	9	3	4	10	11	5	3	13	12	14	8	22	10	12	25	14	11	35
36	19	[illegible]		1	1	1	17	15	14	5	13	10	9	38	6		24	6	6	5	3	2	3	4	2	1	14	20	15	31	10	10	8	27	53	49	3	61	76	20	36	2	64	22	21	37	7	7	2	3	6	8	3	3	7	7	14	9	14	9	11	23	10	7	36
37	2				1	2	6	4	2	2	4	4	3	18	4	2	6	1	1	1		1	1	2		1	3	2	3	6	3	1	3	5	18	3	7	49	16	8	13		33	5	4	18	1	1	2		3	1	1	1	3	2	4	3	3	4	3	6	2	3	37
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39	32	24	4		2	3	29	32	22	13	27	23	13	76	12	1	53	12	13	17	1	2	6	5	6	4	32	23	28	48	16	20	14	59	87	75	16	195	144	39	160	7	119	38	38	76	13	14	6	6	14	10	8	2	14	12	28	17	33	19	24	38	14	14	39
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43	28	2	2	2	6		40	26	19	10	22	16	3	85	13	4	42	13	11			[illegible]	1	5	3		20	21	16	43	18		18	76	160	60	31	320	121	68	148	10	371	117	100	103	26	19	10	4	19	12	11	5	14	22	62	42	66	37	44	59	24	25	43
44	16	[illegible]			6		15	13	11	6	11	7	11	39	[illegible]	3	26	6	6			[illegible]		2	4		13	10	19	19			5	13	26	23	6	68	40	18	94	7	119	43	30	72	17	14	8	4	8	11	3	2	10	15	37	19	31	30	31	35	14	21	44
45	16	[illegible]	2	1	1	2	16	13	10	5	12	2	10	54	8	2	29	8	9	7	1	2	6	5	2	1	15	11	8	25	6	6	3	12	17	22	4	54	37	13	77	6	99	31	31	121	19	16	9	4	8	8	8	2	9	22	40	18	30	27	30	53	20	21	45
46	15	[illegible]		1	8		11	12	12	6	13	8	[illegible]	52		2	29	3	4	4	4		8	4	3	1	15	17	15	37	20	25	13	40	52	41	13	116	75	22	91	15	105	73	122	146	60	16	6	3	12	8	4	4	8	29	111	29	25	12	31	57	26	20	46
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49						1	1	2	1		2			4		1	1	1				4		1		2	2	8	1		1	3		4	4	2	2	6	7	2	9	1	10	9	9	8	5	3	1	1	2	3		1		7	7	5	2	2	3	8	4	2	49
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54		1						1			2			2	1		1										2		8	2	3			2	3	1	2	3	4		5		4	2	4	3	1		3		6	3	1	2	2	2	3		2	1	2	4	2	1	54
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57	9	[illegible]		2	1		15	13	7	3	8	6	8	37	8	3	20	4	3	4	1		4	5	3	[illegible]	13	5	7	23	3	4	4	10	15	12	5	32	31	10	38	3	63	38	41	112	21	16	7	5	11	10	5	1	8	28	36	21	27	20	30	66	26	22	57
58	3						6	4	3	3	5	2	3	16	3		9	2	1	2	3	2	1	2	1	1	4	5	2	8	3	2	2	5	7	10	1	17	17	4	23	3	41	19	18	29	8	4	5	1	4	3	2	2	3	9	19	7	13	12	14	25	9	9	58
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63	4	6					4	7	4	1	6		4	16	1		9	1	2	2			3	1		4	9	5	2	9	6	4	4	7	13	9	2	25	13	3	16	3	25	13	19	30	11	9	3	3	4	5	2	2	4	15	24	10	10	11	15	32	14	9	63
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Butte Urban Transportation Study
1990 Total Origin and Destination Study

Zone of Destination

Zone of Origin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	51	62	63	64	
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66	11	9	1		2		14	15	7	4	8	5	9	40	7	1	19	6	4	6		1	4	1	3	1	12	[illegible]	5	19	4	6	3	9	18	19	5	36	29	9	31	3	52	17	23	39	14	8	7	2	13	12	6	4	11	19	29	10	17	14	23	50	20	25	66
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87	3	2	2			1	2	5	3		3	2	1	17	4		8	1	1				2	1	1		5	1		9	1	1	2	2	2	4		10	7	2	10	1	12	6	3	19	3	3	2	9	6	6	6	3	4	4	2	2	9	4	7	14	5	6	87
88	2	2		1			4	3	3		3		3	12	1		7	1		1		1		1	1	1	4	1	2	[illegible]	3	3		2	4	4	2	5	9	3	6	1	13	5	6	11	5	2	1	9	5	6	5	2	4	2	2	4	5	4	7	12	4	4	88
89	4	6		1			8	4	4	1	2	1	4	21	4		10	2	1				2	2	2	2	5	3	1	10			2	1	4	4	1	11	10	1	14	1	15	5	7	22	4	2	4	9	10	10	6	3	9	9	9	4	10	7	9	17	6	7	89
90	5	5	1	1		1	7	6	4		3	2	5	24	4		12	1	2			1	1	2	2	3	7	3		11	3	1	2	2	6	4	1	15	9	3	14		19	9	9	28	5	4	1	9	11	12	8	4	11	2	14	5	13	11	10	20	9	11	90
91	3	2	1		1		5	3	2	2	2	3	1	17	3		7	2	1	2			2		2	1	6	2	1	9		1	2	3	2	2	1	14	6	1	10		12	6	5	22	2	4	4	2	8	12	4	4	9	6	14	4	7	7	8	17	8	[illegible]	91
92	20	16	2	1	3	1	12	22	14	6	15	11	13	74	11	2	37	3	4	4	1	3	5	5	4	3	14	19	16	50	19	19	11	31	78	58	12	101	86	25	100	12	145	79	94	77	52	14	10	4	30	21	10	7	18	54	71	39	43	26	37	85	33	25	92
93	13	12		2	1		12	13	8	4	9	5	9	50	11		21	6	5	4	3	2	3	2	3	2	12	5	4	25	5	5	3	9	14	14	4	41	25	7	31	3	47	18	19	55	10	4	5	3	17	14	10	4	15	15	26	12	19	18	17	45	18	14	93
94	10	8	1	2			12	13	6	1	8	5	8	39	6	2	20	3	3	2	1	1	5	1	2	3	9	5	5	20	6	6	2	11	17	16	4	36	24	6	31	4	46	20	26	39	14	6	3	3	16	14	7	3	12	16	23	10	15	13	15	34	12	14	94
95	3	4	1		1		5	5	3	2	2	2	4	20	2		12	2	3	1			4			1	5	1	4	9	9	1	2	2	4	6		12	10	3	11		14	5	4	23	4	1	1	1	5	4	5	1	3	5	5	5	4	6	11	10	4	6	95
96	8	7		2		1	11	7	6	3	6	4	5	27	4		11	4	4	3		3	1	1	2	1	8	3	3	13	3	3	3	8	8	8	2	25	13	4	21	1	22	8	13	30	6	4	2	5	5	6	5	2	7	6	14	10	11	11	21	26	7	17	96
97	11	6		1	2		10	8	6	4	7	7	6	24	4	1	18	3	2	4	1	1	3		3		7	5	5	14	5	6	4	6	17	12	3	33	16	5	22	3	29	18	24	31	6	6	2	2	6	7	4	1	9	8	20	15	20	22	30	30	12	16	97
98	4	4	2		1	1	3	4	5	2	5	3	3	15	2	2	10	3	1	2		1	1	3	1		5	5	2	11	7	5	3	9	15	8	3	28	16	5	23	1	31	28	26	18	8	2	4		6	6	1	2	5	7	16	11	17	16	19	24	8	[illegible]	98
99		1					1	1		1	2	1		4			1	1	1	1							1		3	3	1			3	3	2	2	4	5	2	9		5	4	2	5	1	4	1	1		1				3	3	2	2	4	3	4	2	[illegible]	99
100	7	5				1	6	7	4	3	3	4	5	23	3	2	13	3	1	4			1	1	1		7	1		12	1	4	2	8	9	8	1	26	18	4	21		21	12	12	28	2	4	4		5	4	4	1	4	6	13	6	12	10	19	15	6	10	100
101	9	7	1		1	1	13	9	6	3	8	4	6	40	7	1	19	4	5	4	2		4	1	1	1	10	6	7	16	4	5	2	6	11	12	3	29	20	4	26	2	32	12	12	51	4	5	4	1	8	9	5	4	7	6	16	6	12	13	18	21	10	[illegible]	101
102	10	9		1	1	1	9	10	8	3	7	6	6	33	5	2	19	3	3	2	1	2	3	1	2	2	8	5	9	17	9	7	4	10	20	16	5	37	32	10	40	4	55	20	20	47	12	3	1	1	10	13	6	3	10	14	14	6	15	14	15	32	13	[illegible]	102
103	4	5				1	2	5	4	2	4	2	2	16	2		8	1	2	1			2	2			4	6	7	12	5	5	3	11	18	13	3	32	28	8	31	4	46	22	23	17	9	3	2	2	6	3	4	1	6	9	21	4	9	7	11	24	9	6	103
104																															1			1		1		1			1		1	1			1								1									2	104
105	7	6		2		1	5	6	6	1	1	1	5	18	4		9	2	2		1	2		2	3		9	2	1	1	4	2	1	3	7	4	6	5	8	4	10	1	15	7	8	27	4	7	4	1	14	13	10	4	12	10	11	4	13	7	12	23	10	11	105
106	1	1					2	1	1		2	3		7			4	1				1	1	1			2	1	1	5	4	3		2	2	2	1	7	3	2	4	1	9	3	3	9		4		2	5	4	2	1	3	6	1	2	3	3	4	8	3		106
107	1	11	1				1	14	1		1		3	4			2		1	1	1		1				3		4	2	9	5	5	1	1	6	4	5	9	2	1		9	8	7	4	3	1	1		3	3	1		3	3	2	3	5	3	4	3		4	107
108	5	3			1		3	3	4		6	1	4	14	1	2	8	2	1	1			1	1	2	1	2	4	4	8	3	3	3	6	13	10	4	18	18	5	14	2	27	14	11	16	6	3	1	3	4	3	3	1	4	6	14	6	10	7	7	15	6	9	108
109	6	7		2			4	7	4	3	5	3	4	22	2	2	12	2	1			1	2	2	1		4	11		22	1	24	1	24	34	25	11	37	49	16	60	5	76	38	37	34	16	4	4	1	9	6	5	2	5	20	36	17	20	15	25	40	7	16	109
110	[illegible]	2					2	2	1		1	1	2	6			4	1						1	1		2			2	1	1		3	2	1		5	2		2		4	2		1	1	1			2			2	1		1	1	2	1	2		[illegible]	1	110
111		1						2	1				1	2		2		1				1					1			2			4			2		4	2	1	2		6	3	2	4		2			1	2	1			3	2	2	2	1	2	3	[illegible]	[illegible]	111
112	1	1			1			2	2	1		1	1	6	1		2	1				1					3					1		1	2	1	1	5	2	1	4		1	1	1	1		4		4	1	1	1		1		2		1	1	1	1		1	112
113									1			1		1			2													2		1	1	1	1			2	1	1			4		1										1		1					1			113
114		1							1		1		1	1			1				1							2		1				2	2	3		2	2		2		2	2	1	1	1				2				1		3		1		1	2	1		114
115	1							1		1		1					1						1						1					1		1		1		2		1		1		1		1				1		1		1		1		1		2		1	115
SUB.	770	712	64	61	97	51	832	828	573	316	622	441	526	2710	417	88	1453	300	258	253	69	98	261	159	140	115	774	[illegible]	552	1614	626	645	418	1142	1984	1407	430	3835	2833	871	2977	234	4131	1788	1874	3144	866	530	296	205	798	695	431	221	[illegible]	1005	1758	801	1186	893	1206	2327	940	943	SUB.
116	2	1			1	1	2	1	2	2	1	1	1	8	3	2	3		2				2	2	1				1			2	1	3		1	1	2		1		1	1	1	2	2	2				9	5	4	1	5	2	2	1	1	1	1	2	[illegible]	1	116
117						1				1						1								1						1			1		1	1		2	1	1			2				1				1						1				1				117
118	33	20	7	9	9	3	7	12	34	16	17	16	19	23	11	6	44	13	14	13	11	11	22	8	9	9	17	4	15	21	26	22	14	12	47	13	14	67	64	35	77	25	99	35	62	28	7	4	6	7	10	11	8	8	10	7	38	30	18	43	33	35	16	18	118
119								1							1									1							1						1		1		1		1			1					1							1			1				119
120		1					1				1			1		1						1								1						1			1				1					1								1				1					120
121								1						1									1							1				1	1		1	1							1						2	1					1				1		1		121
122		1	2		1		2	1		1		1		1	1			1					1			1	1		1	1	4	1	1	2	4	2	1	4		1	2				1	1			1		1	1	1			1	1	1	1	1	1	2	1	2	122
123		4	1			2		1	1		3	1	1	12	5	3	1	1	2		1	1	2	4	2	1		1		2	4	3	2	5	1	2	2	1	2	1	5	2	1	3	3	3	2	2	2	1	3	4	3	2	3	3	3	2	1	3	1	4	1	2	123
SUB.	35	27	10	9	11	7	12	17	37	20	22	19	21	46	21	13	48	15	18	13	12	13	28	16	12	11	18	5	17	27	34	28	19	23	54	20	20	77	69	39	88	28	105	39	69	35	12	8	10	9	27	22	16	11	18	14	46	35	21	49	39	43	22	23	SUB
TOTAL	805	739	74	70	108	58	844	845	610	336	644	460	547	2756	438	101	1501	315	276	266	81	111	289	175	152	126	792	624	569	1641	660	673	437	1165	2038	1427	450	3912	2902	910	3065	262	4236	1827	1943	3179	878	538	306	214	825	717	447	232	654	1019	1804	836	1207	942	1245	2370	962	966	TOTAL

Table A-2 (continued)
Butte Urban Transportation Study
1990 Total Origin and Destination Trips

Zone of Destination

Zone of Origin	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	SUBTOTAL	116	117	118	119	120	121	122	123	SUBTOTAL	TOTAL	
1	10	10	15	8	10	2	14	7	9	8	6	2	6	9	9	7	3	9	7	11	4	4	3	2	5	5	2	18	13	10	5	9	10	5	1	7	7	10	3		8	2	14	5	5	2		2	1	2	1	806		1	23		1			1	26	832	1
2	11	10	11	8	7	2	11	7	7	6	5	1	7	8	8	5	5	9	6	8	6	5	3	2	4	6	2	14	13	8	4	7	7	3	1	7	7	9	6		5	1	11	4	6	2		3		1	1	726	1	1	28		1			1	32	758	2
3		2	1	1	1		2				1	2	1		1	2		1		1		1			1	1	1		1	3			1				1	1	1					1			1			2	1	75			5				1	1	7	82	3
4	1		2				2							1	1		1	1		1					2			2	1			1				1					1				1					2	1	48			4	1			1	1	7	55	4
5	1	1	3	1	1		3	1	2	1	2			2	2		1	2		3			1			2		3	2	2	2		1	1	1	1		1	1			1	1		1		1			1	1	110			10					1	11	121	5
6			2		1			1	1					1				3		1	1		1	1		1			1			1	1	1			2									1	1			1	1	56			9					1	10	66	6
7	4	14	23	15	18	3	13	12	9	9	5	1	9	11	9	7	7	12	13	9	7	4	4	4	5	8	4	11	12	10	6	11	10	3	1	5	12	10	3		4	2	1	2	4	1	2	2		1	1	827		1	7			1	1	1	11	838	7
8	10	13	16	10	13	2	12	11	7	7	6	3	6	10	10	6	6	12	11	9	5	4	6	2	5	6	4	22	12	14	5	7	8	7		6	11	10	6		6	1	1	4	7	2	1	2		3	2	838	1	1	11					2	15	853	8
9	6	8	9	6	7	3	8	5	6	5	4	2	5	7	7	4	3	7	4	7	4	1	3	3	4	4	4	14	8	8	3	6	6	4	1	5	6	6	3		7	1	1	4	4	1	1	2		2	2	585	1		30				1	1	33	618	9
10	4	4	5	1	4		3	3	2	2	1	2	1	2	4	1	1	3	4	2	2	1	1		3			8	3	2	3	3	3	2		2	4	4	1		1			2	3	1	1			1	1	308	1		14				1	2	18	326	10
11	10	6	8	6	5	1	9	6	6	4	3	2	4	7	8	5	2	5	6	6	5	3	2	3	2	4	3	14	8	7	2	6	10	4	1	4	7	5	4		1	2		3	6	1	2	1		1	1	610	2		18					3	23	633	11
12	4	6	9	4	5	1	7	4	4	5	2	1	2	5	5	3	3	5	4	5	4	1	3	2	2	3	2	11	7	7	2	4	6	2	1	3	4	6	2		1	1	1	4	3	2		1	1	2	1	451	1		15					3	19	470	12
13	5	9	11	5	8	2	8	7	6	4	4	1	5	6	7	5	2	8	6	7	5	2	3	1	4	4	2	14	8	7	5	6	7	3		4	8	5	3		5	1	1	3	5	2	1	2		1	1	544			10				1	1	12	556	13
14	45	39	54	36	42	9	37	42	32	32	17	8	20	34	40	25	17	39	31	40	17	15	18	13	19	24	16	65	51	40	18	27	24	15	3	23	37	33	14		21	6	4	15	20	5	4	7	3	1	3	2,729	7		22	1		1	1	2	34	2,763	14
15	6	6	9	4	6	2	7	7	5	4	4	1	2	6	5	3	4	7	5	6	3	2	2	3	5	4	3	10	7	5	4	4	4	1		4	5	6	2		4			2	3	2		1		1	2	417	3	1	9		1			6	20	437	15
16	1		3	1	2	1	3	1		1	1			1	1	1	1	1	2		1					1		2	2	2	1		2					3				1				1	1			1	2	85			10					2	12	97	16
17	16	22	28	19	21	4	20	18	14	17	8	3	12	20	18	10	10	19	16	16	12	6	8	6	9	13	8	36	23	18	10	12	15	11	2	13	19	18	7		10	4	2	9	13	3	1	4	2	1	1	1,458	1		41	1			1	6	50	1,508	17
18	2	5	6	3	5	1	3	5	3	1	3		2	5	5	2	2	4	4	3	1	2	1		2	3	1	3	5	3	3	5	3	1	1	2	6	3			3	1			2		2		1	1	1	295	1		14					2	17	312	18
19	1	4	3	4	2	2	3	3	3	2	2		3	1	3	2	2	2	3	2	2	1	2		3	2	2	3	5	3	3	3	2	3		1	5	2	1		3			1	1					2	1	254	1		14			1		1	17	271	19
20	1	5	4	3	2	1	2	3	3		3		2	4	2	3	2	3	1	5	1	1		3		2	1	4	3	2	1	4	2	2	1	3	5	1	1					3	1		2			1	1	249	1		9					2	12	261	20
21		1		1	1	1	1	1	1	1				1		1		1	1	2						1		2		1	1		3				1	2			1				1			1		1	2	77			11					1	12	89	21
22		2	1	1	1	1		1	1					2		1		1		2					1	1	2	1	1	2		1					1		1		1									2	1	66	1		11					1	13	79	22
23	2	5	5	1	4	1	3	4	5	2	3		2	3	4	2	1	4	2	3	2	2	1	1	2	2	1	7	5	1	3	2	2	1	2	2	3	3	1		2	1		1	3		1			1	2	269	1		24				1	2	28	297	23
24	2	3	2	2	1	3	3	1	2	2		1		4	1	2		4	3	2		1	2	1	2	2	1	5	1	4		1	1	3		1	1	1	2		2	1		1						1	2	167	2	1	7	1				5	16	183	24
25	1	2	3	2	2		1	2	1	2	1	1		3	1	1	2	2	2	3		1	1	2	1	1	1	4	2	3		1	2	1		1	1	3	1		2		1							1	2	124	1		8					2	11	135	25
26	2		3	2	1		3	1	1	2	2				1			4		1	2	1		1	2	1	1	3	2		1			3			1	2			2									1	2	116	1		9					1	11	127	26
27	10	13	14	9	13	3	14	10	9	5	6	2	5	11	12	8	7	12	10	11	5	6	4	3	8	9	7	16	12	11	4	8	7	5	2	5	10	7	4		9	2		5	5	1	2	2		1	2	785			15	1			1	1	18	803	27
28	10	7	8	3	7	1	6	5	5	5	4	1	3	6	6	3	1	7	3	6	3	1	1	2	2	3	1	19	8	5	2	2	4	3		6	5	6	7		1	2	2	3	10					1	3	609	1		4					1	6	615	28
29	8	8	5	3	4	2	4	4	4	2	2	2	2	3	4	2	1	4	3	6	2	1	2		3	1	2	16	8	5	1	3	3	3	2	2	5	6	5		3	1	2	3	9				1	2	1	541		1	15				1	1	18	559	29
30	22	21	28	15	20	7	24	18	15	13	9	5	10	19	17	11	9	19	15	19	8	7	7	8	9	12	7	51	23	21	8	13	15	8	5	10	19	17	14		9	5	1	8	22	3	2	3	2	1	1	1,621	1	1	20				1	3	26	1,647	30
31	13	8	7	3	5	2	6	3	5	4	5	2	3	3	7	2	3	6	3	5	2	2	2	1	1	3	1	17	6	6	3	3	6	3	2	2	4	9	5		4	1	6	4	4		2			2	1	608	2		22				1	3	28	636	31
32	13	7	8	4	6		7	3	5	4	4	2	3	4	7	4	1	6	3	7	3	2	1	3		3		20	6	6	1	2	8	6		4	4	7	4	1	4	1	6	3	2		1	2		2	2	660	2		19				1	3	25	685	32
33	5	4	4	1	3	1	2	3	2	3	1	1	2	3	3	1	1	3	2	4	1	1		1	1	2	1	11	3	3	1	3	5	3	1	2	2	3	2		1	4	2	1					2	1	2	416	1	1	13				1	2	18	434	33
34	20	10	11	4	6	4	10	4	8	6	6	3	4	8	8	4	3	7	4	9	5	2	2	1	3	2	1	31	8	8	4	8	6	8	3	6	7	10	11		4	2	9	5	23	3	1	2	1	1	2	1,132	1		28				2	3	34	1,166	34
35	34	17	18	10	9	5	14	9	15	11	10	5	8	9	13	7	6	15	6	18	7	6	2	6	4	5	4	77	14	18	4	11	14	15	2	10	10	20	17	1	3	3		14	33	3	1	3	1	4	2	1,984		1	44			1	3	1	50	2,034	35
36	24	16	17	7	13	3	10	7	13	10	5	4	7	9	11	5	4	12	8	14	6	6	2	3	5	4	2	58	14	16	6	7	11	8	3	7	13	16	12		4	2	6	10	27		2			5	2	1,408	1		33			1		1	36	1,444	36
37	9	3	5	1	3		4	2	4	3	3		2	2	4	3	2	3	2	3	1	2		1	2	1	1	12	5	3		1	5	4		3	3	5	3	1	1	1	4	2	12		1		1	2	2	446	1	1	5	1			1	3	12	458	37
38	66	38	43	25	23	10	40	24	32	27	21	10	20	28	34	19	15	30	23	42	15	14	12	8	12	17	13	97	40	35	14	27	30	30	4	27	28	37	31	1	6	6	3	20	38	6	4	7	2	3	2	3,850	1	1	76	1			2	3	04	3,934	38
39	53	27	33	17	21	8	22	17	26	22	14	7	12	22	21	9	10	26	16	21	11	9	8	7	9	10	7	85	27	25	10	13	16	17	6	13	18	33	28	1	8	4	10	15	49	4	2	1		2	2	2,827	1	1	58	1		1		2	64	2,891	39
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41	65	30	42	20	27	9	23	23	33	28	18	10	15	28	29	14	8	27	18	31	12	9	10	7	9	13	8	101	31	30	10	22	21	22	4	22	25	43	35		12	6	6	19	64	5	3	2	2	2	1	2,977	3		70		1			5	79	3,056	41
42	3	3	4	1	3		2	1	3		2		2	3	2	1	1	2	1	4	1		1	1		2	1	10	5	2	1		4	1		1	1	3	3			1	1	2	5					1	2	232	1		22					2	25	257	42
43	60	54	46	25	32	13	40	33	34	29	18	16	15	36	44	23	13	37	27	42	23	15	13	13	14	19	14	148	43	47	13	21	32	33	5	20	35	57	46	1	18	7	10	27	75	3	5	1	4	2	2	4,160	1	1	94	1			1	1	99	4,259	43
44	32	20	15	8	12	6	15	10	12	11	10	12	6	13	18	9	7	15	12	18	8	7	7	4	7	6	6	76	18	21	5	9	19	28	4	12	11	20	24		8	5	6	13	36	1	4		1	2	3	1,781	2		35			1	1	4	43	1,824	44
45	48	22	17	8	8	9	20	9	15	13	13	11	9	13	14	7	6	19	11	25	7	8	3	6	6	9	5	102	17	27	4	15	21	26	2	11	14	18	22	2	9	3	6	13	38	1	2		1	2	3	1,884	2	1	56	1			2	3	65	1,949	45
46	41	41	55	44	54	10	66	53	34	37	19	7	23	39	41	30	27	46	46	51	22	19	20	12	22	27	24	67	55	37	22	32	30	17	5	27	51	49	16	1	28	8	3	16	34		4			1	3	3,148	2		27				1	4	34	3,182	46
47	22	13	12	5	5	6	7	7	7	6	4	5	4	6	8	4	4	12	7	11	4	3	2	3	4	8	2	51	10	16	1	6	6	5	1	3	6	11	9	1	4	2	3	3	16		1		1	1	2	868	3		7			1		4	15	883	47
48	11	9	11	7	7	5	8	5	6	6	4	2	4	6	8	4	3	10	6	8	2	7	2	3	6	7	5	10	8	9	3	1	5	3	2	2	5	8	3		7	1	2	3	6		2			1	2	537	1	1	4				1	2	9	546	48
49	6	5	6	4	4	1	6	3	3	3	2	2	1	4	4	3	2	7	3	3	3	1	4		2	6	2	8	4	4	2	4	1	3		2	4	4	2		5		1	2	2					1	2	306	2		5			1		3	11	317	49
50	2	2	6	5	6	3	5	3	2	3	2		1	4	2	2	3	4	2	3	1		3	1	3	2	2	5	4	3	2	1	4	1			1	3	1		4	2		1	1					1	2	196	1		7		1			1	10	206	50
51	19	11	15	11	16	6	17	11	11	9	4	5	5	11	11	8	7	15	13	12	8	8	5	8	8	10	8	30	15	16	3	6	7	6	1	5	9	12	5		13	3	3	6	9	3		1		3	2	774	5		33	1		1	1	2	43	817	51
52	9	12	14	16	32	7	24	16	8	9	6	1	5	14	13	9	9	19	12	15	8	5	5	6	9	12	10	18	16	12	6	7	8	3	1	3	9	13	3		16	5	1	4	8			2		1	2	700	3		11			1		4	19	719	52
53	6	6	12	15	18	4	24	11	5	5	3	1	3	5	8	7	6	13	9	7	3	3	5	4	7	7	4	12	8	8	2	6	4	2		3	5	7	1		10	3	1	2	5					1	2	426	4		7					3	14	440	53
54	3	4	4	4	10	1	7	4	2	3	3		2	5	3	3	2	6	2	5	1	1	1	4	2	5	4	4	5	4	2	1	2	2	1	2	2	4	1		4	1	1	1	2	1				1	2	217	1		5	1				3	10	227	54
55	9	8	15	11	20	4	18	11	8	8	5	3	4	11	10	7	9	15	11	11	5	6	5	5	8	11	8	17	15	10	5	6	8	4		5	8	10	6		13	3	2	4	6	1		2	1	1	2	630	5		8				2	3	18	648	55
56	25	18	27	15	19	5	17	12	19	9	7	4	5	9	12	6	7	14	7	14	5	3	4	4	9	7	7	56	14	17	4	6	9	8	2	6	7	15	8		10	5	4	8	19	2	1			2	3	1,003	2		7			1		4	14	1,017	56
57	67	29	37	13	16	10	18	16	21	16	14	10	12	18	18	10	6	23	13	22	8	7	8	6	7	13	11	71	25	24	6	15	18	16	4	13	15	19	22	1	12	3	8	12	33	3	2	1	1	2	3	1,790	2		34					4	40	1,830	57
58	20	9	12	6	5	4	7	5	10	8	7	6	8	7	7	4	4	12	7	8	4	3	3	2	6	6	5	39	12	10	3	7	17	12	3	5	9	10	6		5	2	3	6	19		1		1	1	3	803	1		29				1	2	33	836	58
59	19	17	18	10	12	5	18	10	12	13	9	8	10	14	13	12	8	15	13	16	8	5	6	6	11	13	6	41	21	19	5	13	22	19	2	13	12	14	9		12	4	4	8	21	1	2			2	3	1,198	1		16				1	2	20	1,218	59
60	18	14	17	10	8	5	11	11	10	10	8	8	9	8	11	6	7	14	11	10	5	5	6	5	6	10	6	23	19	13	6	12	20	19	5	11	13	13	7		7	3	2	10	14	2	1	1		2	2	893	1	1	45				1	3	51	944	60
61	34	20	28	11	10	6	13	15	19	15	12	9	16	15	12	8	6	20	10	16	7	5	6	4	9	12	8	36	15	15	7	19	33	18	5	18	19	14	10	1	11	4	3	6	24	1	3			2	2	1,188	1		38		1		1	2	43	1,231	61
62	82	51	56	23	23	12	34	30	31	30	20	13	19	34	31	18	13	39	22	35	15	11	13	11	16	22	18	86	44	33	10	26	30	23	3	17	21	33	22		23	7	8	16	45		3	2	1	2	2	2,321	2	1	32	1			2	4	42	2,363	62
63	31	21	24	12	11	4	16	13	17	15	9	4	8	14	11	8	6	15	10	14	7	6	5	5	8	8	11	31	18	13	5	9	10	9	2	7	8	13	8		12	3	2	7	16	2	1	1		1	2	966	1	1	14				1	2	19	985	63
64	24	25	26	11	11	5	14	11	14	12	12	7	13	18	13	9	5	12	11	11	7	6	4	4	7	8	7	26	13	13	7	18	16	13	1	9	14	15	8		8	5	4	7	16		1	1		1	2	935	1		15				1	2	19	954	64

Table A-2 (continued)
Butte Urban Transportation Study
1990 Total Origin and Destination Study

Zone of Destination

Zone of Origin	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	SUBTOTAL	116	117	118	119	120	121	122	123	SUBTOTAL	TOTAL	
65	69	89	116	45	43	13	49	55	50	55	36	12	27	54	49	33	20	51	35	50	25	17	16	18	25	39	23	86	50	41	19	26	28	18	2	16	40	37	19		32	11	9	14	41	1	4	4	1	1	2	2,722	1		5				1	7	15	2,737	65
66	90	74	75	42	34	12	41	31	57	50	32	14	26	48	47	22	13	41	23	45	22	16	10	11	17	21	16	113	37	39	11	24	21	18	2	10	28	33	22		25	8	11	21	53	3	3	3		2	3	2,233	8		11	1		1	2	14	37	2,270	66
67	116	75	127	60	61	13	61	73	70	40	26	7	21	43	52	29	15	39	24	56	17	16	12	11	17	22	19	148	34	42	8	14	16	15	5	15	21	31	35	2	24	8	11	21	55	3	3	2	1	2	3	2,597	8	1	42			1	3	14	69	2,666	67
68	48	42	58	26	33	9	65	32	42	21	13	5	7	22	28	22	18	32	22	43	10	16	8	10	11	12	8	97	18	22	4	6	9	8	3	7	9	22	17		12	6	7	12	34	2	2	2		3	2	1,516	6		26		1		2	3	38	1,554	68
69	41	35	61	34	51	18	91	43	31	20	12	5	8	20	35	29	26	40	36	52	12	14	12	15	14	17	13	95	30	25	5	6	12	9	4	7	11	20	28		19	5	8	16	46	2		3		4	2	1,813	6		30	1			1	4	42	1,855	69
70	16	11	12	9	17	21	20	9	12	7	4	2	4	8	11	5	7	23	8	14	7	4	6	3	9	14	8	34	10	12	4	4	5	5		3	6	9	7		13	3	2	3	12	1	2			2	2	627	2	1	16	1			1	6	27	654	70
71	49	41	62	64	91	21	158	79	49	43	23	8	19	46	89	70	48	93	82	86	18	24	28	31	38	44	24	142	45	39	8	14	15	18	2	14	21	34	40	1	36	12	13	23	62	2	4	6	2	3	2	2,764	9	1	16	1			2	16	45	2,809	71
72	57	33	70	32	43	9	78	47	49	27	15	6	10	26	52	35	23	28	36	91	14	22	16	9	13	18	10	115	21	28	7	10	11	8	3	9	11	24	21	1	16	6	10	15	57	3	1	3		2	2	1,846	6		31	1			2	4	44	1,890	72
73	49	58	70	42	32	11	51	50	49	50	22	7	25	54	62	39	17	40	26	50	29	18	14	9	14	16	16	103	36	38	14	15	14	10	2	11	23	34	21		21	6	10	14	48	3	4	1	1	2	2	1,961	4		16					6	27	1,988	73
74	50	50	39	21	19	9	40	26	50	43	26	10	23	53	53	20	13	34	23	43	20	16	9	7	13	14	14	102	33	35	11	16	16	10	3	9	22	28	20		18	5	10	18	47	1	5	1	1	2	2	1,706	5		22	1			1	8	37	1,743	74
75	37	33	30	10	12	4	21	15	22	28	16	7	14	26	20	11	8	19	12	27	11	7	4	5	8	10	7	64	17	19	14	17	14	11	3	5	27	19	9	1	12	4	4	9	24	1	1		1	2	2	1,090	2		6			1	1	8	18	1,108	75
76	9	14	8	5	4	4	8	7	7	8	8	6	8	9	8	5	2	9	5	6	6	1	3	3	4	4	4	14	9	7	5	9	11	10	2	7	11	8	3		6	1	2	3	9	1				2	2	492			14				1	1	16	508	76
77	27	25	19	9	10	3	19	11	25	22	15	8	9	27	25	8	5	18	9	27	10	7	4	3	6	5	7	80	14	19	10	16	16	11	2	5	24	24	13		8	2	7	9	35	2	2	1		1	3	1,048	4		5				1	7	18	1,066	77
78	43	46	43	23	20	9	46	25	54	51	26	9	25	54	61	20	12	38	30	54	27	18	12	7	11	16	12	209	43	56	13	18	14	11	3	10	27	37	25		21	9	14	17	69	2	4	3		2	2	2,015	7		10			1	1	12	31	2,046	78
79	50	48	52	28	34	10	89	54	61	54	20	7	23	61	81	49	23	36	40	101	36	28	20	14	18	22	17	159	43	49	15	16	17	12	3	10	26	43	28	1	27	8	16	23	71	4	4	4		2	3	2,304	5	1	25		1		1	9	42	2,346	79
80	33	20	28	23	31	6	70	32	39	21	12	4	8	23	49	22	26	29	46	81	20	18	18	10	15	18	15	122	21	30	7	8	7	7	4	6	10	26	19	1	13	6	9	14	43	2	2	2	1	1	3	1,469	4		22			1	1	7	35	1,504	80
81	22	14	14	14	25	6	51	24	15	13	6	5	5	13	22	25	16	69	38	58	12	14	17	17	23	28	16	109	15	17	5	7	8	7	1	6	8	17	15		19	4	8	12	35	1	2	2	1	2	3	1,200	1		24				1	8	34	1,234	81
82	51	37	39	33	41	23	92	29	43	34	18	9	15	37	38	31	68	268	62	53	17	23	31	35	41	47	26	260	50	56	14	19	18	12	3	15	26	44	46	1	44	18	12	24	62	3	5	6	2	3	2	2,721	3	1	20	1			3	19	47	2,768	82
83	34	24	24	19	35	10	80	34	26	23	12	6	10	24	39	45	35	64	55	116	19	28	34	30	40	56	39	244	32	43	12	9	13	11	3	9	17	37	30	1	35	8	15	20	62	4	4	4		3	3	2,093	5		29		1		1	10	46	2,139	83
84	52	44	56	44	57	15	86	94	50	45	27	7	27	55	103	83	59	54	119	156	52	51	53	30	37	62	36	272	70	96	25	25	19	16	4	14	47	59	30		38	16	17	21	80	6	6	4	2	1	3	3,159	25		32	2		2	6	39	105	3,264	84
85	[illegible]	24	19	9	12	7	19	16	30	19	11	2	11	28	34	21	10	19	17	54	21	11	9	4	8	9	10	132	22	40	6	10	7	8		6	17	27	20	1	12	5	7	9	38	2	1	2		1	4	1,163	12		16		1	1	2	20	52	1,215	85
86	17	17	16	13	16	4	23	22	19	15	7	3	7	18	30	20	14	22	31	49	13	15	17	14	19	27	19	72	24	22	5	8	6	4	3	6	9	20	11	1	18	5	8	7	33	3		2	1	2	2	1,028	3		15		1		1	5	25	1,053	86
87	15	9	11	9	12	7	26	17	15	9	4	2	4	11	22	15	17	31	33	54	8	16	13	18	23	29	22	135	15	23	4	4	8	6	2	4	9	20	16	1	19	3	9	12	43	1	2	2		2	3	1,047	4		17				1	6	28	1,075	87
88	12	11	11	7	15	6	30	10	8	7	5	4	3	7	13	11	18	34	31	29	3	16	18	18	24	31	18	83	16	16	3	7	5	6	1	6	7	15	11	1	21	6	6	10	22	1		2	1	3	2	876	3		16			1	2	5	27	903	88
89	24	19	17	12	14	11	35	12	14	13	9	3	4	11	18	17	22	45	40	37	7	19	24	24	42	52	37	160	24	27	5	6	11	7	4	7	12	26	19		63	14	9	18	67	4	3	3	3	4	2	1,408	7	1	13			1	4	4	30	1,438	89
90	40	20	23	12	18	13	46	16	17	14	11	6	5	15	23	18	31	45	59	63	10	27	31	29	51	65	45	279	38	48	9	8	13	10	3	8	14	42	32	1	75	11	18	17	85	3	5	6	2	4	2	1,893	8	1	14			1	5	4	33	1,926	90
91	24	14	18	10	13	6	26	10	15	14	7	3	6	12	15	13	18	26	38	36	7	19	20	19	39	45	41	152	23	26	5	9	7	9	1	9	12	23	20		66	11	9	18	63	3	3	5	1	4	2	1,288	7	1	12				5	3	28	1,316	91
92	90	114	148	97	96	38	143	117	104	104	63	14	80	188	161	122	103	260	230	262	128	84	126	81	156	273	151	486	570	415	172	131	73	41	11	84	219	376	93	2	177	48	39	58	141	25	19	18	5	4	4	8,662	19	1	376	1	3	17	48	32	497	9,159	92
93	[illegible]	[illegible]	34	18	27	11	41	21	37	33	16	6	13	43	42	20	15	50	31	70	23	24	15	15	23	39	23	585	240	161	21	22	23	20	5	24	35	158	124	2	37	14	22	43	112	10	6	4	3	1	4	3,234	8		42	1		2	5	14	72	3,306	93
94	[illegible]	38	40	23	24	13	38	27	40	35	17	8	19	50	49	29	21	53	45	90	36	26	25	16	27	46	27	413	159	175	41	36	22	16	5	23	83	121	58	1	37	13	20	34	98	8	7	4	2	3	3	3,011	31		158	1		7	20	14	231	3,242	94
95	[illegible]	15	8	3	6	4	8	7	15	12	12	6	9	13	15	7	5	14	11	25	9	7	3	3	4	8	5	173	21	42	10	1	14	10	2	12	25	37	22	1	9	3	9	7	37	1	2	2		1	3	987	5		7				1	9	22	1,009	95
96	26	23	14	7	8	4	13	9	14	18	18	9	16	20	17	7	5	18	9	25	8	7	5	6	6	7	7	139	24	36	16	23	27	20	4	12	35	29	16	1	11	6	8	9	45	3	2	2		2	2	1,283	5		8				2	9	24	1,307	96
97	[illegible]	20	17	8	11	5	15	10	15	14	16	12	14	16	15	8	7	18	12	19	9	7	6	5	11	15	7	72	23	21	16	26	36	30	7	25	34	34	23	1	11	6	10	12	42	2	2	1		3	2	1,394	3		28	1			1	4	37	1,431	97
98	[illegible]	16	17	7	11	4	18	10	11	9	10	8	11	11	11	8	7	12	13	13	8	6	6	5	8	12	8	40	19	17	10	21	29	25	8	22	25	24	14	1	11	5	4	10	21	4	1	1	2	2	2	1,086	5	1	68			1	1	10	86	1,172	98
99	4	2	4	4	1		3	2	2	1	4	2	1	3	4	1	3	2	5	3	1	2	2	1	3	2	2	11	6	3	3	1	8	6	2	6	4	6	6		1	2	2	3	9				1	1	2	242	1		9				1	1	12	254	99
100	14	10	17	7	8	4	12	9	10	8	5	9	5	9	11	7	6	14	9	16	4	5	4	6	8	9	9	82	26	24	12	12	29	22	7	25	22	45	42		14	5	6	19	36	3	2	2	1	2	2	1,098	1		22				2	3	29	1,127	100
101	[illegible]	31	20	11	10	7	23	11	22	24	30	12	23	28	24	13	7	25	18	51	16	11	8	9	11	13	9	220	34	87	25	35	34	21	4	25	58	72	34		19	8	11	19	59	2	3	5		2	3	1,882	6	1	8	1			2	11	29	1,911	101
102	[illegible]	35	31	18	22	8	34	26	34	28	17	10	20	39	44	25	17	45	38	55	25	20	19	15	27	43	24	377	158	123	38	28	37	22	5	45	74	136	104	2	30	12	19	67	89	9	7	6	2	2	4	2,882	6		34			2	4	11	57	2,939	102
103	[illegible]	22	35	18	27	7	40	21	21	10	9	6	10	25	27	19	13	46	30	32	18	12	15	12	20	31	21	93	125	56	20	16	23	15	3	42	34	104	52	2	43	10	13	54	48	10	6	7	2	2	3	1,862	5		23				3	8	39	1,901	103
104	[illegible]		1		1		1	1					1		1	1		1		1		2		1		2		2	2	2	1		1	1				2	3			1		1	1						1	44	1		6				1	2	10	54	104
105	21	24	23	12	17	14	35	17	21	20	10	5	9	20	28	13	18	46	33	37	10	18	18	20	65	76	64	178	39	39	9	10	12	12	2	11	18	31	42	1	123	19	11	24	107	5	6	6	2	4	3	1,808	10	1	18			1	6	5	41	1,849	105
106	[illegible]	10	8	6	7	2	11	6	8	5	5		5	7	10	5	4	16	6	18	5	4	3	5	12	11	12	47	14	13	2	5	5	3	3	3	8	13	10		21	15	11	13	50	4	7	4	2	2	3	600	3		6			1	2	6	13	618	106
107	10	11	13	6	7	2	12	10	12	9	5	3	7	15	16	7	8	12	16	16	8	7	8	6	12	16	11	40	22	22	6	9	9	5	3	7	11	22	16		13	5	40	22	32	5	2	6	1	1	2	754	2		10				1	4	17	771	107
108	15	18	21	12	17	5	23	16	16	16	10	3	8	18	21	15	11	23	22	20	9	7	14	8	17	17	18	56	44	30	8	10	15	10	5	19	17	64	52		24	11	23	47	104	6	10	7	1	3	3	1,329	2		30			1	4	4	41	1,370	108
109	44	57	57	36	45	12	60	57	42	43	25	8	33	65	68	43	35	64	61	80	37	33	42	22	68	85	59	146	113	99	35	45	44	22	6	38	62	92	51	1	105	48	34	92	282	25	36	27	6	6	2	3,569	10	1	42			6	16	13	88	3,657	109
110	1	2	3	1	2	1	3	2	4	2	1	2	1	2	2	2	1	4	2	6	2	2	1	1	3	3	2	25	8	10	1	1	1	2	1	2	3	8	11		4	4	4	5	25	12	3	1	1	1	2	263			3		1		6	3	13	276	110
111	3	4	2	5	1	1	4	4	3	3	1	1	1	4	5	2	3	5	5	6	2		4	1	4	3	3	22	6	7	2	3	3	1		4	3	7	8		5	7	4	10	37	2	3			2	3	282	1		4			1	4	4	14	296	111
112	[illegible]	[illegible]	1	3	3	1	5	3	2	2	1		1	3	2	3	4	5	4	3	4	1	2	2	6	5	4	14	6	4	2	2	2	1	1	3	3	6	8		7	5	4	6	26	3		10	3	2	2	259	2		1			1	3	6	13	272	112
113	1		1		1	1	2		1	2	2			1			1	1	4		1	2	1	1	2	2	1	5	2	2		2				2		1	1		6	2	2	1	6	3		3	2	1	3	95	1		2			1	3	4	11	106	113
114	1	2	2	1	3	1	1	2		3		1		2	1	2	1	4	1	4		1	2	2	2	3	3	4	3	2	2	1	1	1	1	1	2	1	2		2	2		1	3		2		1	3	2	124	2		3				2	1	8	132	114
115		1	1	1	1		1	1	1		1	1	1		1		1	1	1	1	1	1	1	1	2		2	2	1	1	1	1	2		1		1		2		1	1		1	2		2		1	1	2	72			4				1	3	8	80	115
SUB	2709	2227	2601	1505	1826	655	2743	1853	1970	1692	1088	514	1014	2008	2303	1470	1189	2723	2103	3102	1148	1033	1039	868	1407	1882	1286	8690	3232	3040	981	1281	1400	1070	255	1087	1861	2886	1864	41	1825	600	731	1316	3561	278	277	251	90	212	245	142,881	371	33	2797	26	15	68	231	579	4,120	147,001	Sub.
116	3	8	7	6	8	4	2	6	3	4	4	1	4	5	4	5	1	2	6	17	8	3	3	1	6	5	6	80	8	36	5	6	1	2		1	7	6	6	1	8	2	2	1	2		1	1	1		1	415		4	749	1	1	12	38	328	1,133	1,548	116
117				1				1										1										1	1					1									1			1						26	3		46	1			1	8	60	86	117
118	4	12	42	30	17	4	21	32	16	25	6	15	5	31	25	24	27	21	32	97	49	16	16	18	13	29	11	120	46	54	7	8	34	75	10	28	11	34	29	5	16	12	10	29	46	2	4	6	5	4	3	2,638	609	48		70	23	84	496	5297	6,627	9,265	118
119		1				1				1								1		1							1	3	1	1	1						1								1							26	1		55			1		5	62	88	119
120		1				1					1				1					1	1						1	4	1			1				1					1				2							30	3		10				2	5	20	50	120
121		1	1		1		1			1			1		1		1			2		1			1		1	20	2	9	1		1			1		2	1		1	1		1	7	1	1	1				78	6		74		1		19	18	118	196	121
122	1	3	3	2	3	2	3	3	1	1	2		2	2	1	1	2	3	2	6	2	1	1	3	6	5	5	75	7	34	2	2		2		3	2	6	4	1	8	3	1	5	22	8	4	3	4	2		317	56	2	122		1	26		189	396	713	122
123	5	14	12	3	5	2	6	3	5	7	8	1	6	9	7	7	8	18	9	29	14	5	4	6	10	8	9	137	14	62	8	10	1	3	1	2	12	11	2	1	4	3	3	3	14		4	4	3	1	2	659	318	10	5797		3	22	131		6,281	6,940	123
SUB	13	40	65	42	34	14	33	45	25	39	21	17	18	47	39	37	39	46	49	153	74	26	24	28	36	47	34	440	80	196	24	27	37	83	11	36	33	59	42	8	38	21	17	39	94	12	14	15	13	7	6	4,189	996	64	6853	72	29	146	687	5850	14,697	18,886	Sub.
TOTAL	2722	2267	2666	1547	1860	669	2776	1898	1995	1731	1109	531	1032	2055	2342	1507	1228	2769	2152	3255	1222	1059	1063	896	1443	1929	1320	9130	3312	3236	1005	1308	1437	1153	266	1123	1894	2945	1906	49	1863	621	748	1355	3655	290	291	266	103	219	251	147,070	1367	97	9650	98	44	214	918	6429	18,817	165,887	TOTAL